Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

REED CLARK ROLLINS, Editor-in-Chief

ALBERT FREDERICK HILL
STUART KIMBALL HARRIS
RALPH CARLETON BEAN
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CARROLL EMORY WOOD, JR
} Associate Editors

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The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Botanical Museum, Oxford St., Cambridge 38, Mass.

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RUMEX THYRSIFLORUS NEW TO NORTH AMERICA

Áskell Löve and Doris Löve

In connection with his studies on the North American representatives of the genus *Rumex*, Rechinger (1937) predicted that the Eurasiatic species *Rumex thyrsiflorus* Fingerh. could be expected to occur on the North American continent. He concluded this from the fact that he had seen a single collection of the species from Haiti and it was unlikely that this plant from northern and eastern Europe and central Asia had been introduced only to this subtropical region in the New World. This prediction can now be verified, because the plant has been found by the present writers to be thoroughly naturalized in a restricted but rather wide area in and around Levis County on the southern shore of the St. Lawrence estuary opposite Quebec City, and on the eastern and southern parts of the Ile d'Orléans. The species grows in abundance near roadsides and in fields within this area, and it also occurs around Quebec City at least north to St. Joseph in the county of Charlevoix.

It was unfortunate that Rechinger (1937) did not study the *Rumex* material of the Marie-Victorin Herbarium of the University of Montreal when he made his investigations on the American species of the genus. Had he done so his prediction would have been superfluous since the herbarium already included four collections of the species from the province of Quebec and one from Ontario. The first of these collections from Quebec was made by Frère Marie-Victorin (No. 15764) on Ile d'Orléans on August 16, 1922, and on the label he remarks: "Partout dans les champs, St. Laurent de l'Ile d'Orléans et dans tous les

environs de Québec." The other three collections from Quebec available prior to the work of Rechinger were all collected within the same area east and west of the estuary, but a further collection, from St. Joseph in Charlevoix County, was made in 1937 by Bernard Boivin (Nos. 1068, 1125, 1126). Of course, all collectors regarded the plant as *Rumex Acetosa* only, and it was reported under that name by Marie-Victorin (1935).

It is evident from the occurrence of *Rumex thyrsiflorus* in the Quebec region that it is an old and very well established introduction, and it may even have been cultivated at some time (cf. Marie-Victorin, 1935). But although it was old near Quebec in 1922 when first observed by Frère Marie-Victorin, it may have been introduced much earlier in other regions, where it has probably not met the same ideal conditions for survival and dispersal. This suggestion is based on the fact that in the Marie-Victorin Herbarium is a specimen collected by J. Macoun in July of 1871 in Harting County in Ontario, where it grew "sparingly in meadows" at that time. And it has recently (1948) been collected from piles of stone and gravel near a ferry dock at St. Ignace in Mackinac County in Michigan by Rogers McVaugh (No. 9297). It is probably introduced occasionally to places having commercial connection with northwestern Europe.

Rumex thyrsiflorus belongs to the *Acetosa* subgenus, which, because of its morphological and biological distinctness, is often regarded as a genus of its own (cf. Löve & Löve, 1948; Löve, 1954). It is a dioecious plant of the section and subsection *Acetosa* (cf. Löve & Sarkar, 1956), closely related to the likewise introduced *Rumex Acetosa* L. and *Rumex ambiguus* Gren. and the indigenous *Rumex alpestris* (Scop.) Löve (cf. Löve, 1944, 1954). The distribution in Eurasia is definitely continental, although the taxon reaches oceanic regions in southern Scandinavia and the Netherlands in the west and in the Russian Arctic in the north (cf. Löve, 1944; Hultén, 1950; Lawalrée, 1953). According to Hultén (1950) the species belongs to the group of West-Siberian continental plants which have dispersed to Scandinavia via both the Baltic countries and Denmark, and it is not known to occur in most of France or in Britain.

Morphologically, the dioecious species of the section and sub-

section *Acetosa* are most easily distinguished from other American *Rumices* by their much enlarged fruit valves without grains, and the hastate or sagittate leaves. They are not easily confused with any of the two introduced or two indigenous species of the dioecious subgenus *Acetosella,* nor are they very similar to the other dioecious American representatives of subgenus *Acetosa,* namely the monotypic endemic southeastern subsection *Americanae* and the likewise monotypic western section *Paucifoliae* (cf. Smith, 1955; Löve & Sarkar, 1956). The valves are never much enlarged in *Acetosella,* which shares with *Americanae* the small and distinctly hastate leaves with rather large basal lobes clearly directed outwards and upwards, while the leaves of *Paucifoliae* lack basal lobes. All the species of the subsection *Acetosa,* however, are characterized by rather large cordate-oblong or spearshaped leaves with the relatively small basal lobes directed either downwards or slightly outwards.

Although Rechinger (1937) reported only one species of this group from North America and predicted the discovery of another, four species of the subsection *Acetosa* do actually occur on this continent. As shown by Löve (1944) and Hultén (1944), the circumpolar arctic-subarctic species *Rumex alpestris* (Scop.) Löve is indigenous in Greenland and in Alaska and the northern Rockies, and it is also met with in the Yukon Territory (D. Löve & Freedman, 1956). Probably all the plants of *Rumex Acetosa* from Alberta and British Columbia studied by Rechinger (1937) were in fact this indigenous species. The taxon is perhaps to be expected also from Labrador and Newfoundland and other subarctic and alpine areas in eastern North America, although the only specimen from the eastern alpine regions seen by the writers, which possibly could represent this species (from Nova Scotia), is doubtful. All other specimens from these regions seen by the writers belong, however, to the typical *Rumex Acetosa* from Eurasia. That taxon occurs occasionally as a waif here and there on the continent, but seems to be fairly well established, though not aggressive, in easternmost Canada and New England. It is abundant in some maritime localities rich in nitrogen in the Gaspé peninsula. *Rumex thyrsiflorus* is known only from the regions mentioned above, but the fourth species, *Rumex ambiguus* Gren., is a garden

plant in a few places in eastern Canada and occasionally escapes cultivation. It is widely cultivated in Europe, especially in France, from where it may have been introduced as a vegetable long ago.

The species *Rumex thyrsiflorus* is characterized by a very thick and long and strong tap-like rootstock, from which a large rosette of leaves and a great number of stems emerge. The stems are usually about 80–100 cm. tall, varying between the extremes 40 and 160 cm. depending on the conditions, and the female plants, which always predominate in number, are on the average 20–40 cm. taller than the male individuals. The ochrea on the stem is laciniate. The leaves on the stem are usually narrower and shorter than the basal leaves, but the latter are always much narrower in *Rumex thyrsiflorus* than in the other species of the group, varying between four and fourteen times longer than broad, narrow lanceolate and practically spearshaped, thick and dark green and frequently with crispate margins. Their basal lobes are rather long and narrow and protrude outwards and downwards. The inflorescence is repeatedly branched and forms a dense tuft. The fruit valves are about 3–4 mm. long, i.e. distinctly smaller than in the other species of the subsection, only slightly colored by anthocyanin before maturing, and the achene is shining dark brown. Cytologically, the species is similar to the other related taxa as to its number of chromosomes, $2n = 14$ in the females and 15 in the males, the differences being caused by the peculiar sex chromosomes, XX in the females and XYY in the males. There are, however, slight morphological differences between the autosome complements in all the species, a fact to be reported in detail elsewhere.

The separation of the four species met with on this continent may be facilitated by aid of the following key of their essential differences:

A. The ochrea entire, or laciniate only in its upper part on mature specimens. An early flowering northern plant with a simply branched panicle with usually strongly reddish colored valves about 4–5 mm. long. The leaves are one to six times longer than broad, rarely almost circular, with the basal lobes directed downwards and inwards; plants with small, thick, and dark green or reddish leaves are typical of exposed places or high-alpine habitats, while in more protected localities the

leaves are large and thin and light green. . **Rumex alpestris** (Scop.) Löve (Syn.: *Lapathum alpestris* Scop., *Rumex arifolius* auct., *Rumex montanus* Desf.).

A. The ochrea laciniate also on young stems.

B. Early flowering plants with a simply branched panicle and only slightly colored valves about 4–5 mm long. The leaves are dark green and fairly thick, two to six times longer than broad, with the basal lobes directed downwards. . . . . **Rumex Acetosa** L.

B. Later flowering plants with a repeatedly branched and usually very dense panicle. The rootstock is very thick and reaches deep down into the soil.

C. Leaves very large and thin and light green, two to four times longer than broad, with the basal lobes directed downwards and inwards. . . . . **Rumex ambiguus** Gren. (Syn.: *Rumex Acetosa hortensis*)

C. Leaves very long and dark green, at least four and up to fourteen times longer than broad, distinctly spearshaped with the basal lobes directed outwards. . . . . **Rumex thyrsiflorus** Fingerh.

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NOTES ON FLOWERING PLANTS IN MINNESOTA

John W. Moore

alien plants: There has been a steady increase in the number of alien plants found growing in Minnesota in woods, along waysides, and in fields and meadows. Some of these may be garden escapes, now well established, while others may be weedy plants of European origin that have appeared recently in Minnesota.

To the known occurrences of **Anthriscus sylvestris** (L.) Hoffman in Newfoundland, Quebec, New Jersey, and New York, Minnesota can now be added. This woodland species was brought in for determination in May 1955 by Francis L. McGuire. An ample series of fruiting specimens was prepared on June 9, 1955 (*J. W. Moore 22574*) from the same extensive patch on the old quarry bank west of the Health Service Building on the University of Minnesota Campus, Minneapolis.

Atriplex glabriuscula Edmonston was obtained on September 21, 1954 by J. W. Moore and G. B. Ownby (*22210*) while on a collecting trip in southwestern Minnesota. This Orach was found in a hay meadow at Pipestone, Pipestone County.

Carduus acanthoides L. thus far has been found only in Becker and Rock Counties. Dr. G. B. Ownbey and Mrs. Ownbey obtained it for the first time in Minnesota while they were making extensive collections of thistles in 1949. The Becker County locality is in an over-grazed pasture 6.2 miles southwest of Lake Park (*G. B. Ownbey and Findley Ownbey 1190*, Aug. 6, 1949). The first Rock County locality is along the roadside near Magnolia (*G. B. Ownbey and Findley Ownbey 1266*, Sept. 4, 1949); a second collection from Rock County was made in a pasture at the Blue Mounds north of Luverne (*J. W. Moore and G. B. Ownbey 22742*, Aug. 7, 1955).

Centaurea montana L. was collected on the flanks of Hunter's Hill, Duluth, St. Louis County (*Olga Lakela 10563*, 1950).

Onopordon acanthium L., the Scotch Thistle, was procured from a colony of plants along a fence row near Edgerton, Pipestone County (*J. W. Moore and G. B. Ownbey 22251*, Sept. 21, 1954). The Scotch Thistle was reported by Warren Upham in his Catalogue of the Flora of Minnesota, p. 88, 1884, where its occurrence as rare at Lake City (Wabasha County), as noted by Mrs. J. W. Ray, is given. In 1891 Conway McMillan reported this plant in the Minnesota River Valley (Rev. Gen. de Bot., **3:** 291). No other reports of it have been found in the literature and no specimens have been deposited in the Herbarium of the University of Minnesota until now.

Pentstemon Digitalis (Sweet) Nutt., has been found in Pine County, near Sandstone (*N. L. Huff*, 1942), and near Hinkley (*F. K. Butters and J. W. Moore 10889*, 1939, and *Chas. A. Fuller*, 1941).

In 1954, some two weeks previous to a botanizing trip to southwestern Minnesota by G. B. Ownbey and J. W. Moore, our good friend and fellow botanist, Prof. O. A. Stevens of the North Dakota Agricultural College, Fargo, North Dakota, had collected in contiguous territory. He had botanized in parts of Pipestone County including the Pipestone National Monument. His generous gift of plants to the Herbarium of the University of Minnesota has made it possible to report some of the plants he found there at that time. **Rumex domesticus** Hartm. (*O. A. Stevens 1511*, Sept. 14, 1954) was growing in depressions by the middle outcrop (of Sioux Quartzite), Pipestone National Monument; **Rumex odontocarpus** Sandor ex Borbos (the *Rumex alluvius* of Gates and McGregor, Trans. Kansas Acad. Sci. **53:** 186, fig. 187, 1950) was found growing in a saline slough ¾ mile south of Louisburg, Lac Qui Parle County (*Stevens 1513*, Sept. 16, 1954) and in a saline ditch near Rabbit River, Wilkin County (*Stevens 1514*, Sept. 17, 1954). In 1948 Prof. Stevens secured specimens of **Sisymbrium Loeselii** L. from Minnesota for the first time. This potentially aggressive weed was gathered in woods along the Red River of the North adjacent to a truck farm where it was said to be frequent (*Stevens 1057*, Sept. 11, 1948). There is also an extant collection of Loesel's Hedge Mustard from Bigstone County. This is from the banks of the Minnesota River at Ortonville (*J. W. Moore 20521*, June 5, 1950.

Veronica longifolia L., collected by Dr. Olga Lakela (Lester Park, Duluth, *13598*, 1951), has been found growing spontaneously in two other counties in Minnesota. Collections of this *Veronica* in the Herbarium of the University of Minnesota in addition to the Lakela specimen are from a point along the Red Cedar River at Austin, Mower County (*J. W. Moore and N. L. Huff 18666*, 1946) and from a woods in the vicinity of cottages at Pelican Lake, Ottertail County (*O. A. Stevens 1463*, 1953).

NATIVE PLANTS: Seemingly the following native plants have not been reported from Minnesota up to the present time.

Carex hystricina Muhl. forma **Dudleyi** (Bailey) Wieg. was found growing along the shore of Wall Lake in Ottertail County (*J. W. Moore 20414*, July 6, 1949) in association with *Juncus Dudleyi* Wieg. *Asclepias incarnata* L., and other marsh species.

Carya ovata (Mill.) K. Koch var. **Nuttallii** Sarg. was discovered in Minnesota for the first time by Dr. Clarence E. Mickel of the Department of Entomology and Economic Zoology of the University of Minnesota. The stand is in Houston County, Minnesota. It is made up of some half dozen trees 12–18 inches in diameter in a woodland on the south side of the Winnebago Valley, 8 miles northwest of New Albin, Iowa. On Oct. 14, 1954, in company with Dr. Mickel, Dr. Donald B. Lawrence, Mrs. Lawrence, and Mrs. Helen Allison, the author made a trip to the site to secure collections for a permanent herbarium record. The forest was made up of oak, maple, basswood, bitternut hickory, and typical shagbark hickory. The variety at this place seemed distinct from

Carya ovata by its smoothish bark and characteristic smaller, compressed nuts. The collections representing variety *Nuttallii* (*22438, 22439*) were made by the party.

Cerastium brachypodum (Engelm.) Robinson was found in Cottonwood County, SW ¼, Sect. 5, Delton Township (*J. W. Moore and J. W. Posz 16933*, May 29, 1944); and from the same county, growing in a prairie strip along the railroad, ½ mile west of Bingham Lake (*J. W. Moore 16998*, May 31, 1945); it was also found growing at the Pipestone Quarry, Pipestone National Monument (*J. W. Moore and Robert B. Hall 16395*, June 10, 1944); and on rock outcrops 4 miles west of Courtland, Nicollet County (*J. W. Moore and N. L. Huff 18511*, June 6, 1946).

Physalis macrophysa Rydb. is abundant at Fort Ridgely State Memorial Park, Nicollet County. Specimens were procured from creek bottom lands (*J. W. Moore and N. L. Huff 19785*, Aug. 28, 1947).

NAME TRANSFERS: **Astragalus striatus** Nutt. forma **Chandonnettii** (Lunell) stat. nov. based on *Astragalus Chandonnettii* Lunell, Am. Midland Nat. **2:** 127, 1911.

On June 16, 1911 Z. L. Chandonnett collected a white flowered *Astragalus* in dry soil in a railroad yard at McHugh, near Detroit Lakes, Becker County. The plant was sent to Dr. J. Lunell of Leeds, North Dakota. Dr. Lunell published a description of the plant in the American Midland Naturalist in 1911. He called it *Astragalus Chandonnettii*. A study of the type proves that is is an ochroleucous form of *Astragalus striatus* Nutt. The type is deposited in the Herbarium of the University of Minnesota (accession number 254878).

Carex turgida (Fernald) stat. nov., based on *Carex amphibola* Steud. var. *turgida* Fernald, Rhodora **44:** 311, 1942. *Carex grisea* of authors not Wahl.

This is a new name for *Carex grisea* of American authors not *Carex grisea* Wahlenberg, Svensk Vet. Akad. Nya Handl. **24:** 154. 1803. The Wahlenberg name is discussed in detail by the late Prof. Fernald in Rhodora **44:** 312, 1942, in his Critical Notes on *Carex*. Prof. Fernald's designation, on page 311, of our American entity as *Carex amphibola* var. *turgida* Fernald places it with its kinship but the diagnostic characters seem to me to warrant specific status. The type selected by Prof. Fernald was collected on open alluvial and marshy flats between Fall Creek, East Hill and Cayuga Lake, Ithaca, New York, June 15, 1914 (*Wiegand and Thomas 1915*). The type sheet is in the Gray Herbarium. —HERBARIUM, DEPARTMENT OF BOTANY, UNIVERSITY OF MINNESOTA, MINNEAPOLIS.

A CONSPECTUS OF THE GENUS OENOTHERA IN EASTERN NORTH AMERICA

R. Ruggles Gates

The genus *Oenothera* has been largely neglected by taxonomic botanists, apparently because of the difficulty in recognizing some of the characters in herbarium specimens. When studied in the wild, however, a great range of variation is observed, and when grown in cultures these differences are found to be practically all genetic. The few species recognized by the older taxonomists are therefore shown to be a very inadequate treatment of the genus and the immense amount of variability it contains.

In a monograph published twenty years ago (Gates 1936), many new species and varieties of *Oenothera* were described after growing them in cultures for three generations. Each culture was very uniform except for occasional trisomic or tetraploid mutations, and they bred true from year to year. Subsequent intensive study of many new seed collections from different parts of eastern North America confirmed in the main the earlier judgments and has led to wider views of the geographical distribution of the forms concerned. The cultures from new localities nearly all fit into the categories already described, so it has been necessary to create very few additional species or varieties in the region of eastern North America.

In order to avoid the multiplication of species, a number of the species originally described have here been reduced to varietal rank by attaching them to the particular species to which they are clearly related.

These forms all have a ring of 14 chromosomes and breed true because of the catenation and the presence of balanced lethals. Each strain thus contains two complexes, which are often surprisingly unlike, as shown in crosses with other forms.

Some time ago I examined all the *Oenothera* collections in the Gray Herbarium and found that many of them were clearly referable to species or varieties already described in the above monograph. This extends the known distribution of many forms.

It seemed desirable to make a conspectus of these forms, with

their known localities, as shown below. Under each species or variety described by me is given first the type locality, then other localities from which cultures have been grown (the cultures continuing for three generations, each generally containing at least 35 plants). This is followed by the words "Gray Herb." and then by the localities from which specimens in the herbarium have been identified, with the date when they were collected. In certain other species which I have not grown in culture only Gray Herbarium specimens are cited. And in certain more western and southern forms only the general area of distribution is given. The status of some of these species is still uncertain.

An extensive monograph of *Oenothera* is in course of preparation, including an intensive study of various local populations and a consideration of evolution in the family *Onagraceae*. This list of species, with the localities where they have been found, will serve as an indication of the geographic distribution of the various forms.

As the genetics of Oenothera is in some respects unique, a word may be added here regarding the evolution of the genus in North America. Various statements on this subject have been published by me in the last forty years. Beginning with a few large-flowered open-pollinated species surviving in the South, a series of dominant mutations for successively smaller flowers has occurred as the genus moved northwards after the Ice Age. The northward movement was accompanied by the development of chromosome catenation, beginning with a ring of four chromosomes and ending with a complete ring of 14. This was accomplished by an exchange of chromosome ends between certain non-homologous chromosomes. The appearance of balanced lethals in the meantime produced plants which bred true although highly heterozygous. And since the small-flowered species were self-pollinating, each such form might be expected to breed true indefinitely. However, this condition is disturbed by (1) the appearance of mutations, (2) the occurrence of very occasional crosses between different forms where they overlapped in distribution. On the other hand, certain species such as *Oenothera missouriensis* and *Oenothera organensis* retained seven free pairs of chromosomes but

developed a series of self-sterility factors which prevented too much inbreeding. By such mechanisms has developed, in the last 10,000 years or so, the great multiformity of forms now spread over the continent. This can only be regarded as an example of extremely rapid evolution.

Distribution of Oenothera (Euoenothera) in North America

Oe. novae-scotiae Gates. Middleton (Annapolis Co.), N. S. Annapolis Valley. Tryon and Ellerslie, P. E. I. Gray Herb.: Beaver River (Yarmouth Co.), N. S., 1920.[1] Tignish and Alberton (Prince Co.), Mt. Albion and Charlottetown (Queens Co.), P. E. I. Var. **intermedia,** comb. nov. (*Oe. intermedia* Gates, Phil. Trans. Roy. Soc. **B226:** 266–268. 1936.) Bear River (Digby Co.), N. S. Gray Herb.: Meteghan (Digby Co.), N. S., 1920. Var. **distantifolia** Gates. Kentville (Kings Co.), Newport (Hants Co.), N. S. Var. **serratifolia** Gates. Kentville, N. S. Gray Herb.: Kingsport, N. S., 1901.

Oe. comosa Gates. Wilmot (Annapolis Co.), N. S.

Oe. Hazelae Gates. Lockeport (Shelburne Co.), N. S., and along the south coast to Halifax. Wentworth (Cumberland Co.) and shore of Minas Basin from Advocate Harbour to Five Islands and North River and from Tennycape to Upper Burlington (Hants Co.), N. S. Gray Herb.: Port Mouton, 1920.[2] Var. **parviflora** Gates. Middleton. Port George on the Bay of Fundy, Port Mouton (Queens Co.) to St. Margaret's Bay, Frayle's Cove and Chester (Lunenburg Co.), Herring Cove, Hubbard and Hubley (Halifax Co.), N. S. Var. **subterminalis,** comb. nov. (*Oe. subterminalis* Gates, Phil. Trans. Roy. Soc. **B226:** 278–281. 1936.) Higgins Brook and Wentworth (Cumberland Co.), North River (Colchester Co.). Gray Herb.: Five-mile River (Hants Co.), 1920.[3]

Oe. grandifolia Gates. Wentworth and Port Howe (Cumberland Co.), Waugh's River (Colchester Co.), N. S. Point de Bute (Westmoreland Co.), N. B. Related forms were grown from East River Point and Blockhouse (Lunenburg Co.) and Halifax, N. S.

Oe. ammophiloides Gates and Catcheside. Guysborough, N. S. and down the coast to Aspatogan and head of St. Margaret's Bay (Lunenburg Co.). Var. **flecticaulis** comb. nov. (*Oe. flecticaulis* Gates, Phil. Trans. Roy Soc. **B226:** 269–272. 1936.) Mouth of Lahave River and Mill Cove (Lunenburg Co.), N. S. Var. **laurensis** Gates. Port Elgin and Cape Tormentine (Westmoreland Co.), N. B.; Matapedia, Carleton and New Carlisle, (Bonaventure Co.), Cape Gaspé and Mont St. Pierre (Gaspé Co.), Les Escoumains (Saguenay Co.) and Lake Temiskaming, Quebec. Gray Herb.: Matapedia, 1928–1929; Carleton, 1904; Little Cascapedia,

[1] The Beaver River specimen differs in having red papillae on the buds.

[2] This specimen has petals ca. 15 mm., midleaf 6.5 cm. × 10 mm. In my cultures the midleaf was 11–15 cm. × 30–38 mm., showing the effects of cultivation on leaf-size.

[3] This specimen differs in having no red papillae on the stem.

1930; Paspebiac Lighthouse, 1902; Manche d'Epée, 1930; Ste. Anne des Monts, 1905; Matane, 1904: Little Metis, 1906; Rivière du Loup, 1913; Mingan Ids, 1924. There are also specimens from Tignish and Cape Aylesbury (Prince Co.) and Wood Island (Queens Co.), Prince Edward Island; and a form in w. Newfoundland (1929) differs mainly in having buds diffuse red with few red papillae.[4] Var. **parva** comb. nov. (*Oe. parva* Gates, Phil. Trans. Roy. Sec. **B226:** 296–300. 1936.) From Mont St. Pierre (Gaspé Co.) to Bic (Rimouski Co.) and L'Islet (L'Islet Co.), Quebec. Gray Herb.: Bic, 1904; Gaspé Mountain, 1927; Anse Pleureuse, Gaspé, 1928; Mont St. Pierre, 1932. A narrow-leaved variety with petals 10 mm. long occurs at St. Joachim (Montmorency Co.), Dolbeau (Lac St. Jean Co.) and Ile aux Coudres (Charlevoix Co.), Quebec.

Oe. magdalena Gates, (1951). Magdalen Islands.

Oe. sackvillensis Gates. Sackville (Westmoreland Co.), N. B. Var. **albiviridia** Gates. Sackville (Westmoreland Co.) N. B. Var. **Royfraseri** comb. nov. (*Oe. Royfraseri* Gates, Phil. Trans. Roy. Soc. **B226:** 285. 1936). Sackville (Westmoreland Co.), N. B. Gray Herb.: McAdam Junction, N. B. 1916.

Oe. leucophylla Gates. St. Vallier (Bellechasse Co.) and Bethier-en-bas (Montmagny Co.), Que.

Oe. biformiflora Gates. South bank of St. Lawrence from St. Roche des Aulnets (L'Islet Co.) to St. Vallier, Charny (Levis Co.) and St. Antoine les Fonds (Lotbinière Co.), north bank at Wolfe's Cove, Quebec City, Richer and Ste. Anne-de-Beaupré (Montmorency Co.), Que. Var. **cruciata** Gates. Quebec.

Oe. Victorinii Gates and Catcheside. Ste. Anne (Kamouraska Co.), Que., Montreal, St. Hubert (Chambly Co.) and Laniel (Temiskaming Co.), Que.; Jordan (Lincoln Co.) and Colchester (Essex Co.), Ontario; Piseco, New York. Var. **parviflora** Gates. Ste. Anne (Kamouraska Co.), St. Antoine (Lotbinière Co.), Three Rivers, St. Vallier, Mistassini (Lac St. Jean Co.), Quyon (Pontiac Co.), Que.; Vineland (Lincoln Co.), Ont.; Piseco, New York. Gray Herb.: Ancienne Lorette, 1928; Piscataquis River Valley, Me., 1897; Willoughby, Vt., 1896 (petals ca. 20 mm). Var. **intermedia** Gates. St. Vallier (Bellechasse Co.), Ste. Anne de Bellevue (Jacques Cartier Co.), Cap Tourmente (Montmorency Co.), Que. Var. **undulata** Gates. York Mills Road, near Toronto, Ont. Gananogue (Leeds Co.), Fitzroy (Carleton Co.), Ont. Thurso (Papineau Co.), Que.

Oe. angustissima Gates. Ithaca, New York. Gray Herb.: Springport (Cayuga Co.), 1918, Lansing (Tompkins Co.), 1918, 1919; Hudson Falls (Washington Co.) 1896 and Ithaca Lake Shore near Estys, 1920, all in New York. Var. **quebecensis** Gates. Cap Tourmente, Que.

Oe. apicaborta Gates (1951). Les Piles (Champlain Co.), Que.

[4] These all have many red papillae on the sepals and stem; ovary 8–11 mm, hypanthium 20–25 mm, bud cone 11–20 mm, sepal tips 2–4 mm. The variety thus extends around the whole Gaspé coast. The leaves are ca. 6–7 cm × 8 mm, much smaller than in cultures (I.9–27 cm × 30–38 mm).

Oe. argillicola Mackenzie. White Sulphur Springs, W. Va., Va., Md. and N. Y. Gray Herb.: Alleghany Co., 1946, and Botetourt Co., W. Va. (petals 32 mm.) Covington, Va., 1947 (petals. 35 mm.); Deerfield (Augusta Co.), Va. (petals 20 mm.) A related specimen in Gray Herbarium from Bedford Co., Pa., 1942, has petals ca. 12 mm. long.

Oe. grandiflora Soland. Dixie Landing, Tensaw, Alabama, (Gates 1915, p. 13). Var. **Tracyi** (Bartl.) comb. nov. (*Oe. Tracyi* Bartl. Rhodora **13:** 210. 1911.) Dixie Landing and Birmingham, Alabama.

Oe. laevigata Bartl. White Sulphur Springs, W. Va., and Alleghanies. Var. **scitula** (Bartl.), comb. nov. W. Va. (*Oe. scitula* Bartl. Cyb. Columb. **I:** 45. 1914). Var. **similis** Gates. St. Vallier, Que. Var. **rubripunctata** Gates. St. Vallier, Les Escoumains (Saguenay Co.), Que.

Oe. venosa Sh. & Bartl. New York.

Oe. eriensis Gates. Colchester Beach (Essex Co.), Ont.; Collingwood (Grey Co.), and Wasaga Beach on Lake Huron (Simcoe Co.), Ont.; Lake Temiskaming, Que. Var. **repandodentata,** comb. nov. (*Oe. repandodentata* Gates, Phil. Trans. Roy. Soc. **B226:** 328–332. 1936.) Colchester, and Colborne (Northumberland Co.), Ont. Var. **niagarensis,** comb. nov. (*Oe. niagarensis* Gates, Phil. Trans. Roy Soc. **B226:** 326–328. 1936.) Niagara Gorge, N. Y., and St. Eustache (Two Mountains Co.), Quebec.

Oe. deflexa Gates. Windsor, Ont. and vicinity, Quyon (Pontiac Co.), Montreal Island, Grenville (Argenteuil Co.), Que. Gray Herb.: Wentworth Co., Ont., between Dundas and Hamilton, 1940 (petals 6 mm.). Var. **bracteata** Gates. Sandwich and Riverside Drive (Essex Co.), Ont.

Oe. pycnocarpa Atk. & Bartl. Ithaca, N. Y.; Long Island, N. Y.; Vineland (Lincoln Co.), Ont. Gray Herb.: Oxford, Conn., 1896; Westerly, R. I., 1912; Canton, N. Y., 1914; Ithaca, N. Y., 1915; Tioga Co., N. Y., 1915; Centre Co., Pa., 1915; Canaan Valley, Tucker Co., W. Va. (alt. 900–1200 m.), 1945. Var. **parviflora** Gates. Hamilton and Georgetown, N. Y. Var. **cleistogama** Gates. Clinton, N. Y.

Oe. cleistantha Sh. & Bartl. New York.

Oe. nutans Atk. & Bartl. Ithaca, N. Y. Gray Herb.: Glen Falls Rd., Warren Co., N. Y.; Garrett Co., Md.; Rappahannock River, Va.; Sussex Co., Va.; Dinwiddie Co., Va.

Oe. atrovirens Sh. & Bartl.[5] (*Oe. cruciata* deV.) Hudson Falls, N. Y. Var. **Ostreae,** comb. nov. (*Oe. Ostreae* Sturt. Zeits f. Abst. u. Vererb. **59:** 367. 1931.) Oyster Pond, Falmouth, Mass.

Oe. cruciata Nutt. Gray Herb.: Somerset, Me.[6]; Cornish, Me., 1891; Cumberland, Me., 1903; Rollingsford, N. H., 1896; Surry, N. H., 1900; Dublin, N. H., 1897; Brattleboro, Vt.; Vernon, Vt.; Cape Ann, Mass.; Northhampton, Mass.; Axton (Adirondacks)[7]; Granville, N. Y.; Marine

[5] Renner (1943) has worked out the lethal and sublethal factors in the *flectens* pollen complex of this species.

[6] Ovary 8–10 mm., hypanthium 28 mm., bud cone yellow, 11 mm., sepal tips 3 mm., subterminal, petals 10 mm., cruciate, midleaf 7.5 cm $\times$ 14 mm.

[7] Differs in having a red stem with red papillae.

City, Mich. Var. **sabulonensis** Fernald. Sable Island, 1913 (type)[8]; J. Macoun, Sable Id., 1899. Var. **stenopetala** (Bickn.) Fern. Nantucket, 1906.

Oe. Robinsonii Bartl. New Hampshire.

Oe. stenomeres Bartl. Maryland.

Oe. brevicapsula Bartl. Chevy Chase, Md.

Oe. paralamarckiana Gates. Penzance, Woods Hole, Mass.

Oe. rubescens Bartl. Nantucket Island, Mass.

Oe. Oakesiana S. Wats. Falmouth and Nantucket, Mass.; New Haven, Conn.; Long Island, N. Y. Gray Herb.: Provincetown and Falmouth, Mass.; Bridgeport, Conn. Var. **Nobska** (Sturt.), comb. nov. (*Oe. Nobska* Sturt. Zeits. f. Abst. u. Vererb. **59:** 367. 1931.) Nobska Point, Woods Hole, Mass. Var. **Tidestromii** (Bartl.), comb. nov. (*Oe. Tidestromii* Bartl. Cyb. Columb. **1:** 54. 1914.) Tatuxent River (St. Mary's Co.), Md.

Oe. Shulliana Sturt. Morristown, N. J.

Oe. canovirens Steele. Illinois. (Nantucket and Manhattan Island) Gray Herb.: Urbana, Ill.; Morgan Co., Champaign Co., Ill. Var. **cymatilis** (Bartl.), comb. nov. (*Oe. cymatilis* Bartl.) Cyb. Columb. **1:** 54. 1914.) Sawyer, (Berrien Co.), Michigan.

Oe. chicaginensis Renner. Chicago, Illinois.

Oe. furca Boedijn. North Town Junction, Minn.

Oe. disjuncta Boedijn. North Town Junction, Minn.

Oe. insignis Bartl. Duluth, Minn.; Saskatoon, 100 mi. north of Saskatoon and Waskesiu, Sask.; Prince Albert, Alta.; Osoyoos Lake, B. C.[9]; Burt, near Moose Jaw, Sask.; Luskville (Hull Co.), St. Jerome (Terrebonne Co.), and Riviere Blanche (Matane Co.), Que.

Oe. perangusta Gates (1950). Stokes Bay, Bruce Peninsula, Ont. Gray Herb.: Stokes Bay, Dunk's Bay and Queenleen Lake, Bruce Peninsula, Lake Huron, Ont.; Temagami Id., in Lake Temagami, Ont.; Algoma Dist., Ont.; Port Colborne, Ont.; Jackfish,[10] Selin, Ravine Lake, Sleeping Giant, Marie Louise Creek and Mazokama Bay in Thunder Bay District, Ont.; Pike Bay, Cass Lake, Minn.; Red Deer Valley, near Rosedale, Alta.; Sandy Creek, Oswega Co., N. Y.; Ridgeway, Elk Co., Penn. Var. **rubricalyx** Gates (1950). Gray Herb.: Jackfish, Thunder Bay Dist., Ont., 1933 (Type). Herb. Univ. British Columbia: in sand ballast on railway, Heron Bay, Ont., in vicinity of peninsula about Lat. 48° 45′ N. Long. 86° 15′ W., *Taylor, Bennan and Harrison,* 1939.

Oe. strigosa (Rydb.) Mack. & Bush. Minn. to Wash., Utah, Kans., N. Mexico. Introduced on Nantucket Id., Mass. Gray Herb.: Big Timber Creek (Sweetgrass Co.), Mont., 1945; Twilight Gulch (Owyhee

[8] Ovary 8 mm., hypanthium 25 mm., bud cone 7 mm., sepal tips 1–2 mm., petals *ca.* 10 mm., cruciate, midleaf 8.3 cm. × 16 mm.

[9] From seeds collected by Prof. John Davidson.

[10] In 1953, I visited Jackfish and found the original station of the red mutation, a patch of 8 plants, all red but one. In 1954 I found the species (with green buds) very uniform along the north shore of Lake Superior from Schreiber to Heron Bay, Ont., and beyond, but no other red mutations.

Co.), Idaho, 1910; Wyoming, 8200 ft. alt. Var. **albinervis,** comb. nov. (*Oe. albinervis* Gates, Phil. Trans. Roy. Soc. **B226:** 339–343. 1936.) Fargo, Kindred and Barrie, N. Dakota. Var. **procera** (Woot. & Standl.), comb. nov. (*Oe. procera* Woot. & Standl. Contr. U. S. Nat. Herb. **16:** 156. 1913.) Winsor Creek, Pecos National Forest, N. Mex.; Arizona and s. Colorado. Var. **cheradolphila** (Bartl.) comb. nov. (*Oe. cheradolphila* Bartl. Bot. Gaz. **44:** 302. 1907.) Washington and Wyoming. Var. **Cockerellii** (Bartl.), comb. nov. (*Oe. Cockerelli* Bartl. ex DeVries, Gruppenweise Artbildung, p. 56. 1913.) Colorado. Var. **subulifera** (Rydb.), comb. nov. (*Oe subulifera* Rydb. Bull. Torr. Bot. Club **40:** 66. 1913.) (*Onagra strigosa subulata* Rydb. Mem. N. Y. Bot. Gard. **1:** 279. 1900.) Montana.

Oe. depressa Greene. Custer, Montana. Annual.

Oe. rubricapitata Gates. Kindred, N. Dakota.

Oe. Macbrideae (Nelson) Heller. Twilight Gulch, Idaho. Gray Herb.: Corral (Blaine Co.), Idaho; Rowland, Nevada, 1912. (Fig. 6, Gates, 1915, p. 31.) Var. **ornata** (Nelson), comb. nov. (*Onagra ornata* Nelson, Bot. Gaz. **52:** 268. 1911; *Oenothera ornata* (Nelson) Rydb. Bull. Torr. Bot. Club **40:** 66. 1913.) Gray Herb.: Boise, Idaho, 1910, 1911.

Oe. Jamesii Torr. & Gray. Texas, New Mexico. Gray Herb.: Sonoita Valley, Ariz., 1874 (petals *ca.* 35 mm.).

Oe. longissima Rydb. Utah, Armstrong and White Canyons.

Oe. organensis Munz. Organ Mountains, New Mexico.

Oe. macrosiphon Woot. & Standl. Contr. U. S. Nat. Herb. **16:** 156. 1913. Not *Oe. macrosiphon* Lehm. in Hamb. Gardenz. **14:** 439. 1858.

Oe. macrosceles A. Gray. Northern Mexico.

Oe. Heribaudii Lev. Mexico, near Puebla.

Oe. Hookeri Torr. & Gray. Mex., N. Mex., Calif., s. Colorado. Gray Herb.: Lake Merced, Calif.; Walker's Basin, Calif., 1875 (petals *ca.* 60 mm., midleaf ca. 10 cm. × 18 mm.); Klickitat Co., Columbia River, Wash., 1906. Var. **angustifolia** Gates, var. nov. (*Oe. Hookeri* var. *angustifolia* Gates, nom. subnud., Mutation Factor in Evol. 30. 1915.) A specie differt, folia angustiora (8–12 mm. lata), subintegra et perobscure denticulata, caulibus gracilibus, claris rubris. Asphalt, Utah, 1894 (Brit. Nat. Hist. Mus.). Gray Herb.: Smoky Valley, Nev., 1865; Parrott, Colo., 1898; Clark Co., Nev., 1938; Fort Tejon, Calif., 1857; Sisson, Siskiyou Co., Calif., 1912; Klamath Co., Ore., 1936; w. Texas to El Paso and New Mex., 1849, etc. Var. **hirsutissima** (Gray), comb. nov. (*Oe. biennis* var. *hirsutissima* A. Gray, Mem. Amer. Acad. **4:** 43. 1849. *Oe. hirsutissima* Rydb. Bull. Torr. Bot. Club **40:** 66. 1913.) Type from New Mex.; also Colo. Gray Herb.: Hamilton Co., Kans, 1893; Coconino Co., Ariz., 1934; Brewster Co., Tex., 1936; Santa Fe Canyon, New Mex., 1897; New Mex., 1847, etc. Var. **irrigua** (Woot. & Standl.), comb. nov. (*Oe. irrigua* Woot. & Standl. Contr. U. S. Nat. Herb. **16:** 155. 1913.) New Mexico. Gray Herb.: Colfax Co., N. Mex., 1934 (7500 ft.); Linda Vista, N. Mex., 1934; Las Cruces, New Mex., 1935; Fort Davis Mts., Tex.; Salt Lake Co., Colo., (6000 ft.),

1934. Var. **Hewettii** (Cockerell), comb. nov. (*Oe. Hewetti* Cock. Gard Chron. **65:** 39. 1919.) Rito de los Frijoles, New Mexico. Var. **parviflora** Gates. Kamloops, B. C. 1889 (British Mus. Nat. Hist.). Var. **Simsiana** (Ser.) comb. nov. (*Oe. Simsiana* DC. Prodromus **3:** 47. 1828.) Mexico. Var. **franciscana** (Bartl.), comb. nov. (*Oe. franciscana* Bartl. Rhodora **16:** 35. 1914.) Carmel Beach, California. Var. **venusta** (Bartl.), comb. nov. (*Oe. venusta* Bartl. Rhodora **16:** 36. 1914.) San Bernardino Co., Calif. Gray Herb: Los Angeles Co., Calif., 1903; Yosemite Valley, Calif., 1911; San Bernardino Valley, 1919; Orange Co., Calif., 1938; Mather, Calif., 1936. Var. **grisea** Bartl. San Bernardino Co. Gray Herb.: San Diego, Calif., 1875; San Diego Co., 1888, 1916; San Bernardino, Calif., 1896; Orange Co., Calif., 1936.

Oe. Reynoldsii Bartl. Knoxville, Tennessee.

Oe. pratincola Bartl. Lexington, Kentucky. Var. **numismatica** (Bartl.), comb. nov. (*Oe. numismatica* Bartl. Cyb. Columb. **1:** 41. 1914.) Lexington, Ky.

Oe. muricata L. Holland (Introduced). Var. **canescens** (Torr. and Gray) Robinson.

Oe. syrticola Bartl. (= *Oe. muricata* deV.) Woods Hole, Mass.; Orange, Conn. Var. **litorea** (Bartl.), comb. nov. (*Oe. litorea* Bartl. Cyb. Columb. **1:** 48. 1914.) Orange, Conn. A red-nerved form named by Renner from Venice, Italy, belongs with this species.

Oe. ammophila Focke. Bremen, Germany and Heligoland (Introduced).

Oe. gauroides Hornem. Maryland; Virginia. Var. **brevicapsula** (Bartl.), comb. nov. (*Oe. brevicapsula* Cyb. Columb. **1:** 42. 1914.) Chevy Chase, Md.

Oe. ruderalis Bartl. Chevy Chase (Montgomery Co.), Baltimore, Md.; Washington, D. C.

Oe. parviflora L. South Harpswell, Me. Gray Herb.: Tacoma Park, D. C., 1902; Little Sands (King Co.), Prince Edward Island., 1914 (No. III33).

Oe. biennis L. Holland; Germany; Lancashire Coast, England (Introduced). Var. **cantabrigiana** (Davis), comb. nov. (*Oe. cantabrigiana* Davis. Genetics 25; 433–37. 1940.) England; Wales; Jersey. Var. **leptomeres** Bartl. Holland; Lüneberg, Germany.

The following are in subgenus *Raimannia: Oe. rhombipetala* Nutt. Minn. to N. Y., Mo., Neb., Ark., Texas. *Oe. heterophylla* Spach. Georgia to Texas. *Oe. Drummondii* Hook. Florida to S. Carolina and west to Texas. *Oe. humifusa* Nutt. New Jersey to Florida and Alabama. *Oe. laciniata* Hill. Maine to Virginia, Florida, Ohio, Kentucky, Texas and New Mexico.

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ADVENTIVE PLANTS IN NEW YORK

Joseph Monachino

The following waifs, immigrants and escapes were collected in southern New York State and are, with one exception, represented by specimens deposited in the Herbarium of the New York Botanical Garden. The exception is *Aphaerema*, and this and *Pyrularia* were the only ones not collected by the writer. *Aphaerema*, *Photinia* and *Rorippa indica* (and of course the fungus), understandably enough, do not appear in either Fernald's "Gray's Manual of Botany" (1950) or Gleason's "The New Britton and Brown Illustrated Flora" (1952). It is definitely not recommended that these, or the New York find of *Pyrularia*, be entered in standard floras on the basis of the present record. Without further proof of naturalization, such singular discoveries should be regarded as merely casual stations, affording little more than first evidence of certain potentialities. The other species noted below suggest emendations, obviously of a minor nature, in one or both of the latest floras of the Northeastern United States.

Sarcosphaera ammophila (Dur. & Lév.) Seaver. *Monachino 517*, Fire Island, Long Island, Suffolk Co., N. Y., June 20, 1948; sand dunes, abundant over a long stretch (several miles) of shore; large collection made. *Monachino 518*, Gilgo State Park, east of Jones Beach, Long Island, Suffolk Co., N. Y., June 27, 1948; pure sand, a colony about 7 feet in diameter; about a mile further east several additional individuals seen. The writer showed this sand cup-fungus to Fred J. Seaver, who made a special trip to Fire Island to see and collect it for himself. The distribution given in Seaver's "North American Cup-fungi" (1942) is Florida to California and Michigan.

Cynosurus echinatus L. *Monachino 559*, grounds of the New York Botanical Garden, Bronx, N. Y. C., June 13, 1955; growing among awned and awnless forms of *Lolium multiflorum* Lam. with both smooth and

roughened upper culms. This species of dog's-tail appears in Fernald but not in Gleason.

Festuca gigantea (L.) Vill. *Monachino 555*, grounds of the New York Botanical Garden, Bronx, N. Y. C., June 22, 1955; abundant weed in one area. This fescue appears in Gleason but not in Fernald. The only previous New York record at the NYBG herbarium was the old Dobbs Ferry collection reported in the Bull. Torr. Bot. Club in 1881.

Pyrularia pubera Michx. *D. Giardano s. n.*, along Grand Central Parkway, near Cunningham Park, Queens, N. Y. C., May 21, 1954; spontaneous near *Rhododendron* and *Kalmia*. A staminate specimen was brought to me for identification by employees of the Park Department; it was thought by them to be "some kind of *Celastrus*." Surprising things sometimes appear among newly planted shrubs on highways and in parks. An outstanding example I recall (voucher not located) is *Aphaerema spicata* Miers, a flacourtiaceous subshrub native to southern Brazil, which was found in the Brooklyn Botanic Garden and referred to me for identification about sixteen years ago.

Amaranthus crispus (Lesp. & Thév.) A. Br. *Monachino s. n.*, Brooklyn, waste place in the vicinity of the Brooklyn Botanic Garden, N. Y. C., 1940; only fragment collected. Besides mine there is in the herbarium of NYBG no United States specimen of *A. crispus* collected less than half a century ago. I have not seen the species since 1940. The illustration for *A. crispus* in the New Britton and Brown is, at least in part, of *A. albus* L. The NYBG sheet of Olga Lakela 1714, Duluth, Minnesota, Aug. 16, 1936, distributed as *A. crispus*, used for the illustration and also as the basis for the "Duluth, Minn." record, is *A. albus*. The half utricle figured on the upper part of the illustration, presumably meant for *A. crispus*, shows clearly the circumscissile character and the sharp sepals of *A. albus*. The drawing of the utricle at the base of the habit sketch of a branch of the plant perhaps also indicates circumscission.

Rorippa indica (L.) L. H. Bailey. *Monachino 516*, grounds of the New York Botanical Garden, Bronx, N. Y. C., May 26, 1948; in grass by roadside near *Rhododendron* planting. Also collected by H. N. Moldenke in the same area on May 28, 1948, and May 16, 1949. I have not observed the plant on the grounds in recent years; matured siliques were not seen. My recollection is that a Moldenke specimen was sent to Reed C. Rollins for determination, but there is no note of this in the Herbarium nor in Dr. Moldenke's field book. Gleason lists the closely related *R. heterophylla* (Blume) Williams for New Jersey, "adventive in N. J. (Moldenke)." There is no voucher specimen in the Herbarium for this record.

Alchemilla microcarpa Boiss. & Reut. *Monachino 560*, Bayard Cutting Arboretum, near Great River station, Long Island, N. Y., June 18, 1955; large dense thriving colony. This species has not been previously reported north of Delaware and the District of Columbia. Its illustration in the New B. & B. shows glabrous, instead of hirtellous, leaf and stipule; the lobes of the stipule are drawn like those of *A. arvensis*

(L.) Scop., ovate, hardly longer than broad, much shorter than the entire portion, instead of "oblong, c. twice as long as broad, nearly as long as the entire portion." The quotation is from Clapham et al., "Flora of the British Isles" (1952), who regard the shape of the stipule-lobes important enough to be a key character in distinguishing this species from the closely related *A. arvensis*. It seems, however, that notwithstanding its inaccuracy the illustration was correctly based on *A. microcarpa* (probably *R. M. Harper 2307*, Athens, Georgia).

Photinia villosa (Thunb.) DC. *Monachino s. n.*, near High Bridge, Manhattan, N. Y. C., May 16, 1953; on a rocky incline, among native species in woodland. *Monachino 563*, from same shrub, June 3, 1956. *Monachino 571*, from a different shrub some distance away, June 10, 1956. Another shrub was seen at the furthest end of the woodland strip, but was not in flower. No fruits or seedlings were found. The *Photinia* was growing sufficiently removed from habitation or plantings to justify being recorded. As commonly known, *P. villosa* is not too rare in cultivation in N. Y. C. There is nothing remarkable about seeing self-sown young plants growing closely around their cultivated parent shrubs and trees. Some examples of this are *Albizzia, Laburnum, Cedrela, Halesia* ("often cult. and occasionally spreading" Fernald), *Styrax, Symplocos, Callicarpa, Clerodendron*. These rarely go far from their parents, and it is difficult to predict whether they will eventually become members of our wild flora. *Phellodendron*, completely disregarded by Gleason, is one that is sure to do so; in fact it already has, but is almost sure to become more wide-spread. It grows with the rapacity of *Ailanthus*, and finds a better footing in the woodlands than does *Ailanthus*. In the New York Botanical Garden grounds, the cork-tree has invaded the Hemlock Forest and competes successfully in the shade and in the open; it can be seen in various stages of development up to fruiting adults. Sometimes a great multitude of seedlings can be observed growing together. They are readily identified by their oval cotyledons which have finely crenulate margins and a clear translucent gland at each sinus. The fruit is a pungent drupe; when the flesh is removed the bony endocarps or stones upon drying snap open by themselves, like follicles. The seeds germinate very easily.

Dolichos lablab L. *Monachino s. n.*, Croton Aqueduct, Westchester Co., N. Y., Oct. 18, 1953; flowers purple. The hyacinth bean has been reported on the Atlantic border only as far north as the District of Columbia.

Anthriscus sylvestris (L.) Hoffm. *Monachino 554*, Croton Aqueduct, Westchester Co., N. Y., June 6, 1954; observed here for many years. The only previous United States specimen at the N. Y. Bot. Gd. was one collected by N. L. Britton on Staten Island in 1895. This species is mentioned here because it grew in such prolific numbers; it formed a dominant plant for quite a stretch of ground and proved itself highly competent to survive strong competition.

Solanum sarachoides Sendt. *Monachino 176*, Flushing, Long Island,

N. Y. C., Sept. 17, 1936; large stand in a waste place. My specimen is the only one from the eastern United States in the NYBG herbarium. This collection was the basis for the "*Solanum villosum*" record in Torreya **40:** 83 (1940).—NEW YORK BOTANICAL GARDEN.

NOTES ON ILEX

Gabriel Edwin

Three changes in the status of taxa, now more or less commonly accepted, are suggested:

1. **Ilex longipes** Chapm. in Trelease, Trans. Acad. Sci. St. Louis **5:** 346. 1889. *I. collina* Alexander, Castanea **6:** 30. 1941.

Alexander proposed *I. collina* as differing from *I. longipes* in coloration of the lower leaf surface, position and size of the leaf-teeth, presence or absence of glands on these teeth, the depths of grooving of the nutlets, and the size and coloration of the fruit. He stated that *I. collina* is most closely related to *I. montana* Torrey and Gray. Woods (Castanea **10:** 126–127, 1951) indicated that the grooving of the nutlets may be less pronounced than described by Alexander, and that the affinities of *I. collina* lie closest to *I. verticillata* (L.) Gray, citing similarities of leaf venation, thickness and number of marginal teeth on the leaves and the shape of the calyx lobes. He also extended the range of *I. collina* from Randolph County, West Virginia to Smythe County, Virginia.

The depth of the grooves on the nutlets of the various taxa in native *Ilex* varies greatly within a species as well as between species and Woods was fully justified in dismissing this character as non-diagnostic.

The number of eciliate calyx lobes in *I. collina* is never greater than six. The usual number in *I. verticillata* is eight. Also, the shape, size and coloration of the leaves separate *I. collina* from *I. verticillata*. It differs from *I. montana* in the length of the pedicels, absence of fruiting spurs, which may also be absent from *I. montana* at times, and in the lack of hairs or cilia on the calyx. The leaves of *I. montana* are larger, darker and more chartaceous.

However, it is very difficult to distinguish *I. collina* from *I. longipes*.

The leaf margins of *I. longipes* may bear only cilia. However, they may also be almost wholly eciliate and slightly glandular, as in the specimens of *Demaree 15663*, Arkansas and *R. M. Harper*, April 4, 1936, Alabama. The Harper specimen displays a slightly more glandular condition. *Alexander, Everett and Pearson*, Alabama, Oct. 3, 1933, has sinuate-margined leaves with few cilia and almost no glands. The collection of *R. A. Dixon 432*, Madison Co., Texas, has eciliate leaf margins but about half the extensions of the veins are gland-tipped. An old Chapman collection from the mountains of Georgia is both ciliate and glandular.

The ciliate-glandular condition is the more prevalent one in *I. longipes*, while the type sheets of *I. collina* are glandular and eciliate. But this glandular-eciliate condition as discussed is not confined to *I. collina*, merely more pronounced. It may possibly indicate change which could lead to speciation, but at present this is merely conjecture. The variation from sinuate margins to ciliate to glandular-ciliate to glandular is haphazard and apparently without pattern except at the edges of the *I. longipes* range. The Texas specimen cited above, the only collection from that state seen thus far, is not typical of either *I. longipes* or *I. collina*. Very possibly it is a local southwest phase similar to that of Virginia-West Virginia which up to the present has been considered to be *I. collina*. No clear break in the continuity of *I. longipes* can yet be seen.

I. longipes and *I. collina* do not differ in size of fruit. Those of *I. longipes* vary from 5 to 9 mm. in diam., a range which includes that of *I. collina*. Fruit color in all native hollies often differs with the individual plants of a species so that any red-fruited holly species displays several shades of red. Each holly fruit color should be stated as a range (i.e.) scarlet to a lighter red for more accurate description. The colors of the fruits in *I. longipes* and *I. collina* readily fall into the same range.

The color of the foliage is another variable characteristic not only in the hollies here considered but throughout the genus. A distinction between "light green beneath" and "yellow-green beneath" seems to me to be untenable especially when there is great variability of this character as in those collections of *I. collina* cited by both Alexander and Woods.

In the general run of collections of *I. longipes*, the extent to which the leaf venation is impressed is closer to that of *I. verticillata* than to that of the type sheets and to some of the collections considered by Woods to be *I. collina*. Nevertheless, taking the collections as a whole, there is no real difference in venation between the sheets heretofore considered *I. collina* and those called *I. longipes*, The very numerous collections of the extremely plastic *I. verticillata* exhibit considerable diversity in the extent to which the leaf venation is impressed.

For the above stated reasons *I. collina* does not warrant recognition as a distinct taxon and is reduced to the synonymy.

2. **Ilex longipes** f. **van-trompii** Brooks, Castanea **5:** 15. 1940 (as *vantrompi*). *I. collina* f. *van-trompii* (Brooks) Core and Davis, Proc. W. Va. Acad. Sci **16:** 39. 1944 (as *Vantrompii*).

With the reduction of *I. collina* to the synonymy of *I. longipes*, the yellow-fruited plants formerly considered to be a form of *I. collina* are recognized under *I longipes* where Brooks first placed them.

3. **Illex verticillata** (L.) Gray. *I. verticillata* var. *padifolia* (Willd.) T. & G.

Var. *padifolia* has long been recognized as a morphologically distinct entity, differing from *I. verticillata* on the basis of leaf-pubescence. The typical form is glabrous or bears trichomes only on the veins of the lower leaf-surface, while the variety has trichomes on the tissue as well as the veins.

A careful study of over 1000 herbarium sheets of the verticillata complex strongly indicates that var. *padifolia* is not distinct from typical *verticillata*. As suggested by Trelease in Gray's Synoptical Flora (1897), "the original *Prinos padifolius* Willd. (Enum. 394) is scarcely more than the common form of *I. verticillata*."

The collection of *William H. Leggett*, July 9, 1870, at Carlstadt, New Jersey, displays the pubescence of typical *I. verticillata* on the upper leaves and that of var. *padifolia* on the lower leaves of the same branchlet. One of the lower leaves shows an example of var. *padifolia* pubescence in the extremely dense condition. The collection of *L. H. Pammel & V. C. Fish 424*, Houghton, Michigan, shows the pubescence of var. *padifolia*,

the typical *verticillata* and an intermediate condition all on one branchlet.

The many borderline cases between the two constitute further evidence that there are two names for one entity. Among collections showing this are *H. A. Gleason & H. A. Gleason, Jr.*, July 3, 1953, Michigan; *R. W. Chaney 201*, Michigan; *C. C. Deam*, Indiana, July 11, and Sept. 20, 1903. All specimens cited are from the herbarium of the New York Botanical Garden.

It should be indicated here that other described varieties of *I. verticillata* may not be distinct taxa, but to determine this, further study is required.

Ilex ambigua (Michx.) Chapm. f. **channellii** forma nova.

Ramuli puberuli pilis brevibus mollibus albis; folia saepius minora, lamina 2.4–4. cm. longa. Differs from the typical form in having the branchlets puberulent with short, soft, white hairs; leaves up to 4 cm. long, but mostly shorter.

The three collections thus far seen are from small trees, about 10 feet high.

TYPE: *R. B. Channell 2440*, Jackson County, Mississippi, about 1½ miles west of Alabama State Line, about 3½ miles N. of Pecan and about 1½ miles N. of U. S. 90, 16 Aug. 1953. (US, ISOTYPE Duke). *Channell 2416*, Jackson Co., Miss. *Channell 2422*, Jackson Co., Miss.—HERBARIUM, U. S. NATIONAL ARBORETUM, BELTSVILLE, MARYLAND.

WHITE-FLOWERED FORMS OF LIATRIS AND VERNONIA.—In the Chicago region two white-flowered forms, one in *Liatris cylindracea* Michx., the other in *Vernonia missurica* Raf., have been discovered within the past three years. Since other white-flowered forms have been recognized in these two genera, it is in keeping with consistency to record the present ones previously undescribed. It affords me great pleasure to associate the names of these plants with their discoverers, Mr. Floyd A. Swink and Mr. Karl Bartel, keen students of the flora of the Chicago region.

Liatris cylindracea Michx., forma **Bartelii** Steyermark, f. nov.—A varietate *cylindracea* recedit floribus albidis.—Indiana: lake sand along

side road, Clark Road, northwest of Gary, Lake County, August 13, 1955, *Karl E. Bartel* (HOLOTYPE in Chicago Natural History Museum Herbarium).

In her monograph of the genus *Liatris* Dr. Gaiser states, "Though no report in the literature has been found of white-flowered plants of this species, one large plant was found, Aug. 21, 1940, by the writer, no. 213, at Turkey Point, Oxford Co., Ont. (G), adding one more species to the list in which albinos exist. As was frequently experienced after transplantation, the albino died at the end of the next flowering season, though other individuals persisted several years longer."[1]

Originally, one plant was found by Mr. Bartel in bloom on August 9, 1953. This plant did not bloom in 1954, but in 1955 two plants were seen six feet north of the location of the 1953 plant. Dr. John W. Thieret of the department of Botany at the Chicago Natural History Museum found several plants of this albino form during 1955 at the same station, but, owing to the rarity of the white-flowered form, did not preserve an herbarium specimen.

Vernonia missurica Raf., forma **Swinkii** Steyermark, f. nov.—A varietate *missurica* recedit floribus albidis.—Illinois: prairie south of 95th Street and west of U. S. Route 45 in Argonne Forest Preserve south of Willow Springs, Cook County, August 11, 1955, *Floyd A. Swink 2775* (HOLOTYPE in Chicago Natural History Museum Herbarium).

Mr. Swink is on the staff of the Department of Pharmacognosy and Pharmacology of the College of Pharmacy at the University of Illinois in Chicago, and has been a keen student of the local flora all his life. His unique book[2] testifies to his unusual knowledge and mastery of the flora of the Chicago region. JULIAN A. STEYERMARK, CHICAGO NATURAL HISTORY MUSEUM AND MISSOURI BOTANICAL GARDEN.

Volume 58, no. 696, including pages 335–369, was issued 23 January, 1957.

[1] GAISER, L. O. The Genus Liatris. RHODORA **48**: 381. 1946.

[2] SWINK, FLOYD A. A guide to the Wild Flowering Plants of the Chicago Region. 160 pp. Rockrose Press, Inc. Chicago, Ill. 1953.

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BRYOPHYTES OF THE MOUNT GREYLOCK REGION V

A. LeRoy Andrews

Long ago in the early years of Rhodora (Vols. 4–11, 1902–09) I published four instalments of lists of bryophytes of the Mt. Greylock area in northwestern Massachusetts, the results of many collecting trips from my home in Williamstown. The last trip covered was that of Oct. 1, 1908. But further ascents of the mountain in vacation periods of 1909, 1910 and 1911, as long as the family home was maintained in Williamstown, yielded some further species and it has occurred to me for completeness' sake to bring these together and present them in a belated fifth instalment.

Ascent by way of the slide on the Adams side did not at that time yield much of bryophyte interest, but ascents by brook beds were still productive, especially the branches of the Hopper Brook, and the Notch with its limestone exposure still furnished calciphile species. The list does not yet claim to be exhaustive, but should give a fairly good idea of the bryophyte flora of the region, which with the highest elevation of the state could be expected to contain some elements rare or not otherwise occurring in Massachusetts.

American interest in bryology has progressed far since these early publications and in some cases the names have been superseded by other synonyms, but in such cases identity will be recognized without further revision. I would only call attention to a few cases where subsequent investigation make correction necessary. For example Grout has established the fact that what had been called *Buxbaumia indusiata* Brid. in America is distinct from the European species and it should accordingly

be corrected to *B. subcylindrica* Grout. Similarly *Pohlia* (also called *Webera*) *proligera* Lindb. was long confused with a variety *decipiens* Loeske of *P. annotina* (Hedw.) Loeske. The *Pohlia* (or *Webera*) *proligera* should then be stricken from my list as I have not seen the true species from Mt. Greylock. On the other hand Frye and Clark in their compilation of the Hepaticae of North America have for some unaccountable reason made my report of *Asterella tenella* (L.) Beauv. (listed as *Fimbriaria*) the basis for a record of *A. Ludwigii* (Schw.) Und. from Massachusetts. According to the publications of Evans, *A. Ludwigii* does not occur in New England or anywhere near it and the *A. tenella* of my list was certainly correctly identified.

The new list follows, arranged alphabetically as before, and without further notes.

Musci

Amblystegiella confervoides (Brid.) Loeske
Amblystegiella subtilis (Hedw.) Loeske
Amphidium lapponicum (Hedw.) Schimp.
Brachythecium Novae-Angliae (Sull. & Lesq.) Jaeg. & Sauerb.
Bryum pendulum (Hornsch.) Schimp.
Cratoneuron filicinum (L.) Roth
Fissidens osmundoides (Sw.) Hedw.
Gymnostomum aeruginosum Sm.
Gymnostomum curvirostrum (Ehrh.) Brid.
Hypnum molluscum Hedw.
Mnium orthorhynchum Brid.
Orthotrichum obtusifolium Schrad.
Pohlia Rothii (Correns) Broth.
Pterigynandrum filiforme (Timm) Hedw.
Rhacomitrium heterostichum (Hedw.) Brid.
Trichostomum tenuirostre (Hook. & Tayl.) Lindb.

Sphagna

Sphagnum fuscum (Schimp.) Klinggr.
Sphagnum Warnstorfianum DuRietz
Sphagnum robustum (Russ.) Röll

Hepaticae

Cephalozia catenulata (Hueb.) Spruce
Cephalozia pleniceps (Aust.) Lindb.
Lophocolea minor Nees
Lophozia bicrenata (Schmid.) Dum.
Lophozia Helleriana (Nees) Boul.
Lophozia porphyroleuca (Nees) Schiffn.
Nardia obscura Evans
Riccardia multifida (L.) Dum.
Riccardia pinguis (L.) Gray
Scapania mucronata Buch

ADVENTITIOUS AND ESCAPED PLANTS NEW TO MISSOURI

Viktor Mühlenbach

During the summers of 1954 and 1955 the writer collected plants on the rights-of-way of different railroads in St. Louis in preparation for a comprehensive adventitious flora of this city. The number of adventitious species and those escaped from cultivation totaled almost two hundred. At the suggestion of Dr. Julian A. Steyermark those plants which have not been previously recorded are being published in the following list. After omitting three or four species not readily determinable without further study, these totaled sixteen. They were, without exception, collected in the city limits of St. Louis. The writer wishes to express his appreciation for the determination, or in other cases for the verification of his identification, of the plants in question to Dr. Edgar Anderson, Dr. H. Merxmüller (Munich), Dr. Reed Rollins, Dr. G. B. Van Schaack, Dr. J. A. Steyermark and Dr. J. R. Swallen. Specimens verifying these records have been deposited in the herbaria of the Missouri Botanical Garden and the Chicago Natural History Museum.

Bromus rigidus Roth. This Mediterranean grass is a common weed in the western states, while it is only seldom introduced or adventive in the other parts of the U.S.A. It has apparently not yet been reported in any of the neighboring states to Missouri. According to Gray's Manual and Hitchcock's Manual of Grasses the nearest points at which it has been reported are in Texas, Mississippi, Virginia and Maryland. It was found in the Bremen Avenue freight yard of the Terminal Railroad, several hundred meters north of the station on a large waste place between the central and western tracks. There was only one plant, but it was a large and well developed specimen, May 30, 1955 (*V.M. 614*). The herbarium of the Missouri Botanical Garden contains one wretched specimen of this plant with only a few spikelets from Missouri. Evidently this collection has not been reported previously. The data are "Courtney, Mo., July 1, 1904 (*B. F. Bush 2067*)."

Festuca arundinacea Schreb. This European grass seems to be even rarer than the above. Gray's Manual did not mention it at all, although Hitchcock cites it from Ohio and Michigan. A few plants were found on a stone ramp covered with vegetation near to the Rutger Street Warehouse, May 14, 1955 (*V.M. 576*).

Puccinellia distans (L.) Parl. This Eurasian grass is mainly met with

in eastern and western states. In the central states there are records only from Wisconsin and Michigan. A small colony was discovered 100–200 meters north of the Municipal Bridge between the right-of-way of the Terminal Railroad and the Mississippi River levee, May 23, 1954 (*V.M. 70*). It was not found again in the summer of 1955.

Panicum texanum Buckl. A native plant of Texas, it has been introduced at several localities, especially in the southern states. According to Hitchcock's Manual, the nearest points to Missouri are in Oklahoma, Mississippi and Alabama. Gray's Manual does not mention it at all. The plant resembles *Panicum miliaceum* L. which also occurs in St. Louis and was at first mistaken for it. Only a few plants were found in Baden freight yard of M.-K.-T. Railroad, along the most western siding (near Dodridge Ave.), October 22, 1954 (*V.M. 517*). It was not observed again in the summer of 1955.

Miscanthus sinensis Anderss. While the adventitious nature of the grasses mentioned above is not questionable, the situation of this Eurasian plant seems to be otherwise. It is often cultivated for ornament because of its showy appearance. Occasionally it escapes from cultivation and naturalizes. A map in Hitchcock's Manual shows a half-a-dozen states where it is found growing wild. The nearest known points are in Texas and Alabama. Gray's Manual also mentions Ohio. In St. Louis, it has been found in the railroad yards twice: opposite the Hussmann Refrigerator Company plant, along the right-of-way of the Terminal Railroad, between West Florissant Ave. and Broadway, October 1, 1955 (*V. M. 822A*); Carrie Avenue freight yard of the Rock Island Railroad, in the northeastern corner, about 100 m. southeast of the station, November 27, 1955 (*V. M. 860*). At both localities only a few plants were found.

Erianthus Ravennae (L.) Beauv. The situation of this European grass is like that of *Miscanthus sinensis*. It is also cultivated for ornament; it also escapes from cultivation, but is rarer than the previous species. Gray's Manual mentions this grass as becoming naturalized from Maryland southward and Hitchcock's Manual as established in Arizona. It was discovered along the ditch west of the right-of-way of the Burlington Railroad, north of East Grand Ave., just opposite Cemco Manufacturing & Supply Company's building, October 17, 1954 (*V. M. 500*). There were two specimens almost 3 m. tall. As they grew in huge clumps, one of them almost 120 cm. in diameter, it may be presumed that both plants had persisted for some time. They were also observed through the summer of 1955. They could be considered to be naturalized, but the locality is a dangerous one for plants because they could be easily destroyed. The presence of *Althaea rosea* Cav. and of cultivated irises in the near vicinity suggest their origin as escapes; on the other hand, it is worthy of mention that the big elevator of the Norris Grain Corporation is only a few hundred meters north of the locality and that the area around this elevator is particularly rich in adventitious species.

Sorghum vulgare Pers. var. **technicum** (Koern.) Jav. (broomcorn). This variety of sorghum which furnishes the material for brooms, was

discovered by Dr. Edgar Anderson. The station was in the North St. Louis freight yard of the Burlington Railroad, along the highway which branches off the foot of Carrie Avenue to the north, August 6, 1955 (*V. M. 711*).

Silene dichotoma Ehrh. This Eurasian plant is, according to Gray's Manual and Britton and Brown's Illustrated Flora, widely distributed as a weed in the U. S. A. The data for the first record of this plant for Missouri is right-of-way of the Burlington Railroad, between East Grand Ave. and Ferry Street along the sidings. Only one specimen was found, July 9, 1955 (*V. M. 672*). The specimen was badly damaged by a sprayed weed killer, but it was still identifiable.

Spraying weeds is a widely followed practice by all the railroads in St. Louis. It was carried out in the beginning of July the last summer. The consequence was generally disastrous for the plants of the railroad tracks. The vegetation does not recover at all in very many places. In other places annuals gradually appear after a considerable time. Apparently perennials suffer least. The parts above ground mostly perish, but later they begin to come up again from roots, rhizomes, etc. Some of them even manage to produce flowers and fruits later in the same season.

Cardaria pubescens (A. Mey.) Jarm. This presumably Asiatic plant is, according to Gray's Manual and Britton and Brown's Flora, quite common in northwestern states, but apparently much rarer in other parts of the country. The nearest point to Missouri is in the state of Michigan. The data are: Lesperance Street freight yard of the Terminal Railroad between Victor and Rutger Streets, several hundred meters south of the station. One specimen, May 23, 1954 (*V. M. 62*). The plant resembles strongly the more frequent European *Cardaria Draba* (L.) Desv. The latter also occurs in St. Louis and has developed two isolated but dense stands. This growth in dense mats is very typical for *C. Draba* in Europe. According to G. Hegi (Illustrierte Flora von Mittel-Europa) the abundant vegetative proliferation usually forms colonies with a large number of individuals. On the contrary, only a single specimen of *Cardaria pubescens* was found in St. Louis. It was not observed again in the summer of 1955.

Raphanus Raphanistrum L. This also is a very troublesome weed in many parts of Europe, established, according to Gray's Manual and Britton and Brown's Flora, in many states of the U. S. A. Up to the present, it has not been recorded for Missouri. The data are: North St. Louis freight yard of the Burlington Railroad, in the northwestern corner, just south of Humboldt Ave., opposite the engine house of the yard. One specimen, May 30, 1955. (*V. M. 620*). The plant is quite young and does not show the typical fruit form. Nevertheless, the sepals of fully developed flowers which are all strictly erect, the outer being saccate, confirm the identification.

Sisymbrium Loeselii L. This Eurasian plant is, according to Gray's Manual and Britton and Brown's Flora, only local and occasional in our

range, while becoming a weed in the western states. The data of collections are: Lesperance Street freight yard of the Terminal Railroad south of the signal-box Carroll Street Tower. Only a single specimen, badly damaged and covered with grease, June 19, 1954 (*V. M. 183*). Not observed at the same station in the summer of 1955. Carrie Avenue freight yard of the Terminal Railroad. Four specimens, more or less isolated, mostly in the northern part of the yard, south of Humboldt Ave., May 8, 1955 (*V. M. 570*).

Lathyrus hirsutus L. This plant of southern Europe is seldom met with in the U. S. A. Gray's Manual gives the distribution as "Virginia to Alabama and Mississippi." A small colony, closely intermingled with *Vicia dasycarpa* Ten. was discovered in St. Louis on the right-of-way of the Frisco Railroad between Macklind Ave. and Evens and Howard Sewer Pipe Company's plant, along a siding, May 29, 1954 (*V. M. 96*). In spite of careful and repeated search in the summer of 1955 it was not possible to find it there again.

Hedera Helix L. The only shrubby plant in this list and a native of Europe, *H. Helix* is very often cultivated in this country. According to Gray's Manual and Britton and Brown's Flora it has occasionally escaped and partly established itself in Virginia and southward. Now it seems that this ornamental plant is also established in St. Louis in the Lindenwood freight yard of the Frisco Railroad, on the northeastern embankment of the Fyler Bridge, in the vicinity of the engine house. September 10, 1955 (*V. M. 764*). Its growth is more or less prostrate and it must have been there for some time, judging by its abundance.

Solanum tuberosum L. Escapes of common cultivated plants are often overlooked. This species has not been recorded for Missouri. It was found on the right-of-way of the Terminal Railroad just opposite the Continental Grain Company's Brooklyn Street elevator. One specimen, without flowers, probably because the collection date was an early one, May 15, 1955 (*V. M. 584*).

Petunia axillaris (Lam.) BSP. This often cultivated South American plant was found by Dr. E. Anderson. It grew on a dumping ground between the right-of-way of the Wabash Railroad and the Waterworks conduit track, north of Adelaide Ave., August 6, 1955 (*V. M. 707*). The herbarium of the Missouri Botanical Garden contains a specimen of this species from Missouri not previously reported. The data are: Collier St., Hannibal, Mo., R. R. banks, *Rev. John Davis 7517*.

Franseria discolor Nutt. North St. Louis freight yard of the Burlington Railroad, in the northwestern corner, along the sixth siding counted from the crew house in the southeast direction from the latter, August 14, 1954, September 19, 1954, September 18, 1955 (*V. M. 349, 439 & 809*) all from one quite large colony; Carrie Avenue freight yard of the Rock Island Railroad, in the southeastern part along the eastern sidings, just opposite the engine house, August 28, 1955 (*V. M. 738*). This plant is the only one in the list which could be native to Missouri. Gray's Manual gives the habitat and the range of it as, "Dry sands and plains,

Wyoming to Arizona, locally east to Illinois." The herbarium of the Missouri Botanical Garden contains two sheets of it from Illinois from McHenry County and from the vicinity of Ottawa in the valley of Illinois. At both places where I collected *F. discolor*, there were many adventitious plants in the vicinity, so it seems that in our case it is an adventitious rather than a native plant.—SAINT LOUIS MISSOURI.

PLANTS NEW TO ILLINOIS AND INDIANA AND THE CHICAGO REGION

JULIAN A. STEYERMARK, FLOYD A. SWINK, AND JOHN W. THIERET

SINCE the publication of The Vascular Plants of Illinois,[1] the authors have found the following records which are of particular interest, as either new to Illinois or Indiana or to the flora of the Chicago area. All specimens are deposited in the herbarium of the Chicago Natural History Museum.

1. ADDITIONS TO THE FLORA OF ILLINOIS

Beckmannia syzigachne (Steud.) Fern. In their Vascular Plants of Illinois, Jones et al. record this species only from Clyde, Cook Co., the collection by L. M. Umbach. This station is now destroyed. However, the species has recently been collected in the state. The data for the new record are as follows: marshy ground on the south shore of Loon Lake near the village of Loon Lake, Lake Co., July 23, 1955, *Swink 2772*.

Miscanthus sacchariflorus (Maxim.) Hack. This eastern Asiatic ornamental grass, not included in the Eighth edition of Gray's Manual, is reported in the Hitchcock-Chase Manual of the Grasses of the United States as an escape in Clinton County, Iowa. Mr. Chester E. Hansen, faculty member at the Oak Park (Illinois) High School, recently collected the grass in Muscatine County, Iowa, and Rock Island County, Illinois. This Rock Island County collection and an earlier collection by the senior author[2] at Glen Ellyn, Du Page County, Illinois, constitute the first records for this state. The data for these collections are: in ditch along an improved road just east of Mississippi River, about 1 mile south of route 92, Rock Island County, Sept. 5, 1955, *Hansen 4;* vacant lot just south of 215 Lorraine Road, Glen Ellyn, Du Page Co., Oct. 30, 1951, *Steyermark 73078*.

Polygonum cespitosum Blume, var. **longisetum** (De Bruyn) Stewart. Although this has been noted in backyards and gardens in Chicago,

[1] Jones, Geo. Neville, Fuller, Geo. D., Winterringer, Glen S., Ahles, H. E., & Flynn, Alice A. Vascular Plants of Illinois. 46. 1955.

[2] Steyermark, J. A. Bull. Chi. Nat. Hist. Mus. **23** (3): 5. March, 1952.

only the following collection is extant: Elmhurst, Cook Co., July 21, 1949, *Swink* s.n.

Veronica longifolia L. Two spontaneous collections of this cultivated garden species have been found: open ground on the south side of North Avenue in approximately the 8700 block, Melrose Park, Cook Co., June 26, 1955, *Swink 2770;* Thatchers Woods Forest Preserve, River Forest, 1937, *Gordon Pearsall.*

Viburnum Lantana L. This cultivated species has been found to occur spontaneously and away from any near habitation at the following natural wooded area: woods of York Forest Preserve south of Elmhurst, Du Page Co., Nov. 5, 1955, *Swink 2782.*

Aster laevis L., forma **Beckwithiae** House. The data for this collection are: Palatine, Cook Co., Sept. 24, 1938, *H. C. Benke 5945.*

Aster puniceus L., forma **candidus** Fernald. This white-flowered form has been collected at Elgin (north part), Kane Co., Oct. 1, 1928, by *Benke 4835.*

Sanvitalia procumbens Lam. This species was collected as an escape from cultivation at the following locality: corner of Stewart Avenue and 67th Street, Chicago, Cook Co., Sept., 1938, *Lorraine Engelhardt.*

Helianthus salicifolius A. Dietr. A large colony of this western species for a number of years has been dominating a field where it was first noted by Mrs. Julian Steyermark. It is well established and about five hundred plants occur at this locality: at northeast corner of Dempster Street and Major Avenue, just west of Eden's Expressway and east of Morton Grove, Cook Co., Oct. 14, 1955, *Steyermark 80329.*

Arctium minus (Hill) Bernh., forma **pallidum** Farw. Two collections of this form are known: Jefferson Park, Cook Co., August 4, 1941, *Benke 6134;* vacant lots in Kankakee, Kankakee Co., August 1, 1913, *Arthur W. De Selm 409.*

2. Additions to the Flora of Indiana

Aristida basiramea Engelm. This grass has not been reported previously from Indiana. The collection data are as follows: locally common along railroad tracks east of Grant Street, south of 9th Avenue, Gary, Lake Co., July 31, 1955, *Thieret 1498.*

Gypsophila scorzonerifolia Ser. The collection, here cited, apparently the first record of this species as an escape in the United States, was made in Lake County, Indiana. A dense colony of the plant was discovered extending some 120 feet along the railroad tracks on the east side of Gary. As the collection of *Gypsophila* in the herbarium of the Chicago Natural History Museum was not adequate for critical study, material was sent to the Royal Botanic Gardens at Kew, where it was identified as *G. scorzonerifolia.* The data for the collection are: dense colony extending for 120 feet along New York Central railroad tracks just north of highway 12, 1.5 miles east of Lake Street, Gary, Lake Co., July 2, 1955, *Thieret 1404.* The plant was observed to be a glaucous perennial with 3-nerved leaves (except the upper ones), flowers white

with a pink tinge, 6–7 mm. across, 5 mm. long, the petals somewhat less than twice as long as the sepals, and the pedicels glandular-pubescent.

3. Additions to the Flora of the Chicago Region

The following records were not included by Jones et al. in their Vascular Plants of Illinois or have been collected since the work was in press.

Populus canescens (Ait.) Sm.

The data for this collection are as follows: open ground of Illinois Beach State Park, south of main parking lot near Lake Michigan, north of Waukegan, Lake Co., Sept. 10, 1955, *Swink 2780.*

Dianthus deltoides L. This has been collected at the following locality: openings in level woods, Aurora, Kane Co., 1937–38, *Gordon Pearsall.*

Silene regia Sims. The following specimen collected in northern Illinois is considerably north of its known range: roadside, highway 45, Will Co., July 24, 1931, *Carl Buhl 395.*

Paronychia fastigiata (Raf.) Fernald (typical). The data for this collection are: Riverside, Cook Co., Sept. 26, 1885, *W. C. Ohlendorf.*

Lotus corniculatus L. The data for this collection are: Hopkins Park, Kankakee Co., July 15, 1955, *Karl Bartel.*

Eupatorium coelestinum L. The data for this collection are: Forest preserve near Riverside, Cook Co., 1937–38, *Gordon Pearsall.*

Hypochaeris radicata L. The data for this collection are as follows: Arlington Heights, Cook Co., Sept. 10, 1929, *H. C. Benke 4929.* The 1929 collection is apparently the earliest record noted for this species in the Chicago area. It has been seen since in and around the city of Chicago along highways and boulevards, but the regular mowing along these highways prevents the plants from flowering.—CHICAGO NATURAL HISTORY MUSEUM AND COLLEGE OF PHARMACY, UNIVERSITY OF ILLINOIS, CHICAGO.

CAREX MOLESTA IN MASSACHUSETTS

Richard J. Eaton

Among a number of specimens collected some years ago and set aside for later study is a *Carex* § *Ovales.* By using Fernald's key in Gray's Manual 8th Ed., it seemed to run down to *C. molesta* Mackenz. unequivocally. However, this species is not represented at all in the herbarium of the New England Botanical Club, and by specimens in the Gray Herbarium (annotated by Fernald in 1941) from only two New England stations: one from Lake Champlain, Vermont, and one from Hartford County, Connecticut. In contrast, there are specimens from seventeen localities in New York State. Being unfamiliar with it myself, I decided to solicit expert opinion from Drs.

H. K. Svenson and F. J. Hermann. They are in agreement that my specimen should be referred to *C. molesta*, although Dr. Hermann writes that it is not typical compared with the plant of the mid-West. Accordingly, I am placing it in the Club Herbarium under that name, with the accompanying data: Moist field in rear of Old Manse, Concord, Massachusetts, *R. J. Eaton*, 17 June 1934. It is annotated by Hermann as "atypical".

When Mackenzie (1931) published *C. molesta* he cited the type collection as from Wyandotte County, Kansas, and the distribution: "Dry woodland, N. Y. to Kansas and Nebraska", omitting any reference to its nearest affinities. However, his key clearly indicated that he considered *C. brevior* to be its closest relative and separable from it chiefly by the shape, texture and nervation of the perigynia. He placed it in a group of closely allied species of the series Festucaceae in the following order: *C. tenera*, *C. tincta*, *C. normalis*, *C. festucacea*, *C. molesta*, *C. brevior*. This order, incidentally, is followed in Gray's Manual.

Gates (1940) reduced it to an infraspecific status as *C. brevior molesta*. Fernald (1950), whose knowledge of *Carex* in the Gray's Manual range was profound, maintained the species but with a broader concept of its definition and range. He amplified Mackenzie's description in respect to key characters and stated its distribution to be "dry or slightly moist open ground, borders of woods, etc., Mass. and Vt. to Sask., s. to Del., D. C., Tenn., Ark., Kans., and Colo." Gleason (1952), on the other hand, following Gates, united *C. molesta* with *C. brevior* as scarcely specifically distinct, and even suggested that the former might be a hybrid with *C. normalis*.

Dr. Hermann writes me that in his experience the two are sharply distinct in the mid-West and as far east as Pennsylvania and western New York, but in New England transitional forms, mostly referable to *C. brevior*, seem to be the rule. However, in 1954, he collected *C. molesta* in Litchfield County, Conn., at what appears to be the second known station for the species in that state.

At the Gray Herbarium there are about 102 sheets in the *C. molesta* folders, of which 49 were annotated "C. brevior, K. M."

(presumably in 1915 or thereabouts) and re-annotated "C. molesta M. L. F. 1941" (7 merely bearing the words "C. molesta" in Fernald's handwriting). There are 16 additional sheets annotated by Fernald, but apparently not seen by Mackenzie. With a very occasional exception all this material had been originally determined as C. (spp.) var. brevior. Thus there seems to be ample material, even at a single institution, on which to base a judgment about the proper rank to assign to this taxon. Also, it seems reasonable to infer that *C. molesta* is in actuality a taxonomic segregate from *C. brevior*, despite Mackenzie's silence on the point.

Judging from its representation in the Gray Herbarium, the New York Botanical Garden and the National Herbarium, *C. molesta* is rare east of the Hudson River. I have been unable to trace Fernald's authority for including Massachusetts in its range. That it should turn up in Concord emphasizes again the truism that novelties are always possible even in the most thoroughly botanized localities.

Apropos Gleason's tentative suggestion that we are possibly dealing with a hybrid between *C. normalis* and *C. brevior*, it is well to bear in mind that hybrids in the genus *Carex* are generally considered to be rare and almost always infertile. The ample material at the Gray Herbarium is quite inconsistent with such a hypothesis in the case of *C. molesta*. There appears to be little reason for not accepting Dr. Hermann's conviction that it is a distinct and stable species west of New York, with transitional forms confined chiefly to the northeast periphery of its range. This is contrary to expectation were we dealing with a hybrid. In this connection I have secured his permission to quote from a recent letter to me as follows:

"But no such theory (hybridity) is required, it seems to me, to explain the prevalence of transitional forms in a part of the geographic range of a taxon and their absence from other parts. It is rather generally held, I believe, that in the origin of species, whether the means be hybridity, natural selection or any others, the change is gradual (except in cases of mutation). The differences between daughter- and parent-species are at first bridged by innumerable intermediary types, so at this stage we have not distinct species but a variety or, as the moderns prefer to dub it, a subspecies. Later when the transitional forms have either entirely disappeared, or practically so except in a local section of its total area,

the taxon becomes a species. (This concept is pretty well developed by G. Einar Du Rietz in his "Fundamental Units of Biological Taxonomy", Svensk Botanisk Tidskrift 24: 333–428. 1930.) So when a species has not quite become finally demarcated, as in the case of *C. molesta*, an occasional intermediate is to be expected and such intermediates are quite likely to be concentrated in some portion of its geographic range. In my experience they seem to occur chiefly at the periphery of the range, at the portion relatively recently invaded by the species and farthest from its center where it has been longest established and where the distinctions are most pronounced and stable (in this case Kansas and Nebraska). A similar case is that of *Juncus dudleyi* which, although amply distinct from *J. platyphyllus* in the New England States, breaks down completely in the Southwest where transitional forms outnumber the sum of extremes."—LINCOLN, MASSACHUSETTS.

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A NEW SPECIES OF TERNSTROEMIA FROM JAMAICA, B. W. I.

Clarence E. Kobuski

Botanically speaking one of the least explored areas on the island of Jamaica is the John Crow Mountain range in the parish of Portland at the eastern end of the island. This range, a rugged limestone tilted plateau, reaches an elevation of 3800 ft. No roads cross it and even access to its slopes is limited to trails. Because of their location the John Crow Mountains are the first to intercept the rain laden northeast trade winds and for this reason the rainfall in the mountains is heavy. Reasonable estimates place the annual rainfall near the crest at 300 inches while even the driest location near the coast at Priestman's River where records are kept reveal an annual precipitation of 100 inches. The heavy rainfall has eroded the limestone rock into a treacherous dogtooth or honeycomb surface which makes travel both dangerous and exhausting. For reasons of limited accessibility, difficult travel and heavy rains, few botanists have ventured in the John Crow Mountains and relatively few botanical records are available. Britton

and Harris have collected the lower slopes especially at the southern end, and more recently George Proctor of the staff of the Institute of Jamaica has crossed the range and made several other excursions toward the crest of the mountain mass. One of the most interesting approaches has been from the land settlement area at Ecclesdown. The approach to the mountains follows a trail leading to areas of limited cultivation, beyond which are blaze marks leading to an erosion valley on the escarpment. A rugged climb up this valley brings the botanist to an eastern shoulder of the John Crow Mountains, an area of a most interesting stunted mossy or elphin forest. George Proctor has collected alone in this area several times, and at other times has had the company of Richard A. Howard. Each trip during the varying seasons of the year seems to have yielded new species or species new to Jamaica, as well as range extensions for Jamaican endemics. The following new species of *Termstroemia* was collected by Howard and Proctor on their most recent trip to this area in September of 1956, and is named for Professor Howard.

Ternstroemia howardiana Kobuski, sp. nov.

Arbor 4 metralis, ramulis verticillatis, rugosis, glabris, teretibus, striatis, griseis. Folia apice ramulorum congesta, coriacea, glabra, obovata, 4–7 cm. longa, 2–4 cm. lata, apice rotundata vel late obtusa, basi cuneata vel attenuata, subtus pallidiora, margine plana (in sicco subrevoluta), integra, venis obscuris, 8–10 paribus, petiolis 7–10 mm. longis. Flores solitarii, pedicellis glabris, ca. 1.5 cm. longis, tenuibus, ancipitibus; bracteis 2, oppositis, glabris, decurrentibus, crassiusculis, inaequalibus, margine glanduloso-denticulatis, bractea extera deltoidea, ca. 1.25 mm. longa, 0.75 mm. basi lata, intera deltoidea vel deltoideo-ovata, ca. 1.25 mm. longa, ca. 1 mm. basi lata; sepalis 5, imbricatis, inaequalibus, crassatis, rotundatis vel subrotundatis, exterioribus duobus ca. 4 mm. longis et 3.5 mm. latis, subconcavis, margine glanduloso-denticulatis, interioribus tribus concavis, margine leviter glanduloso-denticulatis vel integerrimis, 4–5 mm. longis, 4–5 mm. latis (4×4.2, 4.8×5, 5×5 mm.); petalis 5, albis imbricatis, basi leviter connatis, odoratis, subaequalibus, subrotundatis, apice acre apiculatis, ca. 7 mm. longis, exterioribus duobus ca. 6 mm. latis, interioribus tribus 4–4.5 mm. latis, margine scariosis; staminibus 55–65, seriatis (ut videtur 3), glabris, basi ad corallam adnatis, longissimis (exterioribus) 5.5 mm. longis et brevissimis (interioribus) 3.5 mm. longis, filamentis 3–3.5 mm. longis (exterioribus) et ca. 1.5 mm. longis (interioribus), basi (2/3) dilatatis ad 0.5 mm. diametro, supra (1/3) constrictis, antheris ca. 2 mm. longis,

connectivo apice 0.5 mm. projecto; ovario conico, glabro, ca. 3 mm. longo et 2 mm. diametro, 2-loculato, loculis pauci-ovulatis. Fructus non visus.

Jamaica: portland parish: John Crow Mts., 2.5 miles southwest of Ecclesdown, alt. 2500 ft., *R. A. Howard and G. R. Proctor 14841* (Arnold Arboretum—Type; Institute of Jamaica—Isotype), Sept. 14, 1956 (tree 12 ft. high; leaves lighter below; corolla white, fragrance sweet and spicy; stamens cream-colored).

This new species is undoubtedly an isolated endemic, probably confined to the John Crow Mts. of Jamaica. This is not unusual since isolated endemism is quite common in the family. Its closest relative is *T. hartii*. In habit and leaf characters the two species are quite similar. However, the latter species can be separated from *T. howardiana* by the characters found in the larger flowers. In *T. hartii* the pedicel measuring 1.5 5 cm. long is much sturdier and generally considerably longer. The sepals measure 6–7 mm. in length with the petals (ca. 8 mm. long) barely showing beyond the sepals. On the other hand, in *T. howardiana* the pedicels are shorter and distinctly more slender. The sepals are smaller measuring ca. 4 mm. in length with the petals nearly twice as long (7 mm.) and extending conspicuously beyond the sepals.

A character, not generally observed in other species of *Ternstroemia*, is found in the filaments of the stamens of *T. howardiana*. The lower two-thirds of both the long and the short filaments are conspicuously dilated while the upper third is thread-like. In most species the entire filament is thread-like. This observation was made from both the dried material from the herbarium sheet and preserved material fixed in the field by the collectors.—HARVARD UNIVERSITY, CAMBRIDGE.

DISTRIBUTIONAL AND NOMENCLATORIAL NOTES ON GALIUM (RUBIACEAE)

Hugh H. Iltis

The following data are partly a by-product of preliminary work on the *Rubiaceae* of Wisconsin (Urban and Iltis, 1957) and partly a result of field work in Arkansas during 1955. I wish to thank G. N. Jones and M. Bergseng for the loan of specimens from the University of Illinois Herbarium.

1. **Galium brevipes** Fern. and Wieg.[1] in Indiana. "Flora near Lake Michigan," swampy ground, Forsythe, Lake County, Indiana, September 13, 1879, *E. J. Hill.* (In Herbarium, Univ. of Illinois).

In Wisconsin and Indiana at least, this species is clearly distinguishable from its relatives; there can be no doubt that the collection cited above is of this small, intricately-branched, northern taxon. Hill's collection from Forsythe (which is near the present Beverly Shores, Porter County (not Lake County!), directly on Lake Michigan) apparently came from a habitat very similar to the ones on the lakeshore in Wisconsin where *G. brevipes* occurs, namely from a moist or swampy swale behind the dunes. Although this species is not listed by Jones and Fuller (1955) for Illinois, it is likely that it once grew there, for its habitat, close to the cool lakeshore, has all but been obliterated by Chicago, Evanston and nearby cities. We may assume that *G. brevipes* has been extinct in Indiana for over 50 years, since the Umbach Herbarium at the University of Wisconsin, which contains perhaps 35,000 numbers mainly from the northern Indiana lakeshore, does not contain a single specimen of this taxon. Umbach was an unbelievably "voracious" collector, particularly in the area of the Indiana Dunes in northern Porter and Lake Counties, and it appears doubtful to me that in his decades of avid collecting he would have missed even so small a plant. Hill's collection of 1879 antedates not only Umbach's "hey days" by about 20 to 30 years but also the growth of Michigan City and of the Gary industrial area and the age of "Beach Cabins" with "improved" lots.

2. **Galium labradoricum** Wieg. in Illinois. Cedar Lake Bog near Lake Villa, Lake County, Illinois, June 3, 1942. *G. N. Jones 15221:* Marsh, 3 miles N. of Capron, Boone County, Illinois, 6/8/46. *E. W.* and *G. B. Fell* no. f *46344*, (Both U. of Ill. Herb.); swampy ground along Nippersink Creek, N. end of Wonder Lake 2.5 mi. NW. of Ringwood, June 15, 1947. *J. A. Steyermark 64533* (Chi. Nat. Hist. Mus.).

This species is not listed by Jones and Fuller (1955) because the first two cited specimens were identified and presumably

[1] **Galium domingense,** nom. nov., *Galium brevipes* I. Urban, Symbolae Antillanae **7:** 415. 1912, not *Galium brevipes* Fern. & Wieg. Rhodora **12:** 18. 1910. Urban's homonym refers to an endemic species of Haiti and Sto. Domingo, of which I have seen a specimen in the Missouri Botanical Garden Herbarium (*Valeur 729*). It proves to be a highly distinctive annual with minute leaves, and a 4-parted, pink corolla.

mapped as *G. obtusum* Bigel., a closely related species, of which *G. labradoricum* appears to be a specialized northern derivative, while the last specimen was annotated by the Austrian monographer of *Galium*, F. Ehrendorfer, as *G. tinctorium*! These stations, being in northernmost Illinois, fit in well with those in Wisconsin, where it occurs scattered through most of the state, with its occurrence in Indiana, where Deam (1940) shows it in eight of the twelve northernmost counties, and with the one station in North-central Iowa (Leyendecker, 1941).

3. **Galium texanum** A. Gray in Arkansas. Top of southern arm, Horseshoe Mountain (Little Short Mountain), 6 mi. W.N.W. of Paris, S.E. Franklin County, Arkansas. (93° 49′ W.; 35° 19′ N.). Elev. 1,000 ft. June 10, 1955. *Hugh and Grace Iltis 5412.*

The above collection came from a steep, dry, rocky and sandy, south-facing *Juniperus-Celtis* glade, only about 5 yards from the upper edge of the vertical sandstone cliffs (Savanna Sandstone-Upper Pennsylvanian), high above the Arkansas River Valley on the S. E. edge of flat-topped, mesa-like Horseshoe Mountain. *Galium texana* grows there, straggling under bushes in grass, amidst *Opuntia* sp., *Monarda fistulosa* var. *mollis, Hypericum pseudomaculatum, Valerianella longiflora, Astranthium integrifolium, Spermolepis echinata, S. divaricata,* and *Tragia urticifolia.* Like the associated taxa, *G. texanum* is a southern species, previously known only from Texas and Oklahoma (Hopkins, 1943). The closest stations in the latter state are in Comanche Co., about 300 miles from the Arkansas station. Specimens have been deposited in the Herbaria of the Univ. of Wisconsin, Univ. of Arkansas, Southern Methodist Univ. and Pomona College, and in the Gray Herbarium.

I would like to thank Dr. L. H. Shinners for verifying the identification.

4. **Galium boreale** L. ssp. **septentrionale** (Roem. and Schult.) Iltis, comb. nov. Based on *Galium septentrionale* Roem. and Schult. Syst. Veg. **3:** 253. 1818. *Galium boreale* L. of all American authors, including its varieties, not *G. boreale* L. *sensu stricto.*

Löve and Löve (1954) clearly demonstrated that the American and eastern Asiatic form of *Galium boreale* L. *sensu lato* differs from the Eurasian form by several minor morphological characters (larger flowers, anthers and fruits, more pubescent nodes,

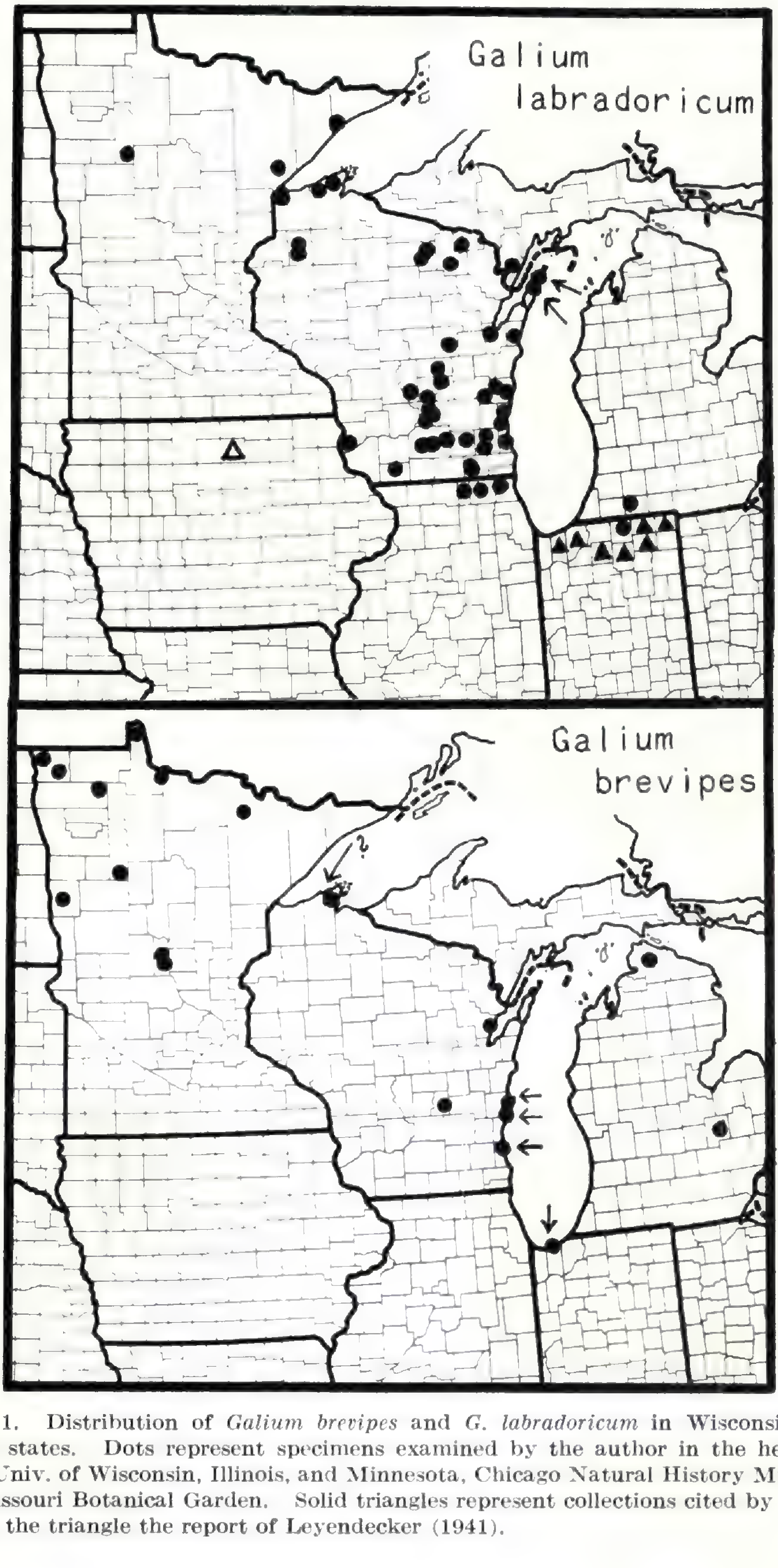

FIG. 1. Distribution of *Galium brevipes* and *G. labradoricum* in Wisconsin and nearby states. Dots represent specimens examined by the author in the herbaria of the Univ. of Wisconsin, Illinois, and Minnesota, Chicago Natural History Museum and Missouri Botanical Garden. Solid triangles represent collections cited by Deam (1940), the triangle the report of Leyendecker (1941).

and differently shaped bracts and panicles), and suggested that it should be called *Galium septentrionale* Roem. and Schult., a species based on the *Galium boreale* of Pursh's Flora. The Löves further demonstrated that *G. boreale sensu stricto* is tetraploid with 2n = 44, while the American and eastern Asiatic material is hexaploid, with 2n = 66. Since their distribution map shows a clearly allopatric supplementary distribution of the two forms, such as is usually found in subspecific entities, the forms furthermore showing some morphological overlap, it seems advisable to reduce the American-Asiatic taxon to a geographic subspecies of the Eurasian one.

In fruit pubescence, the variability of ssp. *septentrionale* parallels that of ssp. *boreale*, and appears to be an interesting case of homologous variation. Since the *varietal* names currently used for the American forms are all based on European material of ssp. *boreale*, new varietal or form names for the variants of ssp. *septentrionale* must be found since such have never been published in conjunction with that subspecies. *Galium septentrionale* is described as a pubescent-fruited plant. Which of the two types of fruit pubescence Pursh's specimens show is not apparent from the description, though it is probable but not certain that it is of the sparsely pubescent form presently called var. *intermedium*. Should the Japanese plants of *G. boreale* prove to belong to ssp. *septentrionale*, as the Löves maintain, then four varietal names of Nakai and one of Maximowicz (cf. Nakai, 1939) will be available for our taxa, and their types will have to be studied. Because of these difficulties, I am not prepared at the present time to wrestle with the problems of nomenclature and typification of the forms of ssp. *septentrionale*, which falls beyond the scope of this study.—DEPARTMENT OF BOTANY, UNIVERSITY OF WISCONSIN.

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The Misuse of the Term Taxon:—Dr. H. J. Lam, of the Rijksherbarium, Leiden, invented the neo-Greek word taxon (plural taxa), but he may live to regret the day. It was intended purely as a nomenclatural tool to replace the cumbrous expression "taxonomic group" that was formerly used in the International Rules of Botanical Nomenclature. The term was first proposed to the Symposium on Nomenclature called the "Utrecht Conference" that was held prior to the Seventh International Botanical Congress in Stockholm in 1950; it was adopted unanimously by the Conference, as reported in Chronica Botanica.[1] It seemed a happy idea at the time; this simple term facilitated the work of the Editorial Committee in drawing up the new wording of the International Code that resulted from the Stockholm Congress; and it also had the advantage of being usable internationally.[2] Some of the Rules of Nomenclature apply specifically only to families, or to genera, or to hybrids or other groups, whereas others apply to all groups equally, and it is here that the term taxon finds its legitimate use, as for example in Article 46: "A name of a taxon is not validly published when it is merely cited as a synonym." Taxon here denotes *any* nomenclatural category.

To say that the word taxon "caught on" is to put it mildly. It has spread like wild-fire until now, only eight years after its invention, every student not only knows the word but thinks that he knows what it means—that is, just practically everything. We now read of "short-haired taxa," "taxa that grow in swamps," and so forth. This unlimited extension of the meaning is not only ridiculous, it is worse, not precise. To use the word to mean plants, populations, races, species, or what have you, is to debase it and to turn it into a meaningless catch-all. It should be kept clearly in mind that a taxon is an abstraction and that it does not have leaves nor does it

[1] Vol. 12, p. 12. 1950.

[2] And so it has proved; some Latin American botanists have adopted it into Spanish so fervently that they are giving it the plural "taxones."

grow anywhere at all in the world. Where the words "taxonomic group" can not be appropriately substituted, the word taxon is misused. Let us return to the original meaning before it is too late, and use taxon only in technical nomenclatural discussions, except of course when we wish to refer to our notable international journal.—C. V. Morton, U. S. NATIONAL MUSEUM, WASHINGTON, D. C.

Arctium in Illinois.—Among weedy species of plants in Illinois *Arctium minus* Schk. has been collected and observed through the length and breadth of the state. Reports of the occurrence of this introduced Eurasian weed are not surprising, but records of *A. lappa* L., and a first collection for the state of *A. tomentosum* Mill. may be of interest.

At the present time four Illinois collections of *A. tomentosum* Mill. are known. Mr. R. T. Rexroat of Virginia, Illinois, is apparently the first collector of this burdock from Cass and Morgan counties. Mr. Rexroat has supplied specimens, which are deposited in Illinois State Museum Herbarium, and has furnished the following description: "Plants one and a half to two feet tall, with several stems from the base, but without large leaves, petioles hollow and involucre arachnoid. These plants flowered a week or ten days before *A. minus* Schk." The following collections are cited: CASS CO.: June 15, 1956, southwest of Ashland in a pasture, *R. T. Rexroat 2847, 2848.* MORGAN CO.: June 15, 1956, northwest of Prentice in a pastured area, *R. T. Rexroat 2849, 2850.*

There are probably not more than half a dozen Illinois collections of *A. lappa* L. on record and the following may be cited: COOK CO.: Aug. 16, 1903, roadsides and borders of woods, *O. E. Lansing 1841.* DUPAGE CO.: July 28, 1953, waste place east of Wheaton, *R. A. Evers 40006.* KNOX CO.: Aug. 16, 1952, field border 4 miles west of Victoria, *R. A. Evers 35568.* Sept. 22, 1954, roadside north of Galesburg, *G. S. Winterringer 11265.* MCHENRY CO.: Sept. 15, 1948, roadside near Richmond, *R. A. Evers.* VERMILION CO.: August 31, 1956, railroad embankment nine miles west of Hoopeston, *G. S. Winterringer 12791, 12792.*—Glen S. Winterringer, ILLINOIS STATE MUSEUM, SPRINGFIELD.

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STUDIES IN THE HIPPOCASTANACEAE, III
A HYBRID SWARM IN THE BUCKEYES

JAMES W. HARDIN

One particular population of shrubby buckeyes has caused a great deal of interest among taxonomists and naturalists for a number of years. This population of *Aesculus* is in Georgia, just northeast of Stone Mountain at the northeast edge of DeKalb County, on U. S. Route 78 (Atlanta to Athens). A large number of specimens, presumably from this population, are preserved in herbaria throughout the United States. One of the earliest of the collections was made in 1869 by Wm. M. Canby, one of the first botanists to visit this area after the Civil War (McVaugh, 1943). Later collections were made by J. K. Small (in 1891, 1893, 1895), C. S. Sargent (1899 and 1900), A. H. Curtiss (1901), T. G. Harbison (1911, 1912), W. W. Ashe (ca. 1920) and a number of more recent taxonomists. The Stone Mountain area is also of particular interest, in relation to buckeyes, since it is the type locality for *Aesculus georgiana* Sarg. and *A. georgiana* var. *pubescens* Sarg.[1] Also, the type of *A. harbisonii* Sarg. (*A. pavia* × *sylvatica*) was grown at the Arnold Arboretum from seed collected at Stone Mt. by Harbison in 1905.

I was first shown this population in the summer of 1952 by Wilbur H. Duncan who had made general observations on it for some time and who had become interested in the variation. There is no reason to think that this population has changed, significantly at least, since Canby and others visited there.

[1] In the original descriptions, Sargent (1913) cites a collection made by Harbison (No. 907, April 30, 1912) as the type for var. *pubescens*. There is no designation of the type for the species, however he did cite five specimens. Of these five syntypes, Sargent's collection dated April 16, 1900 is hereby designated as the lectotype for this species. Both type specimens are in the Arnold Arboretum Herbarium.

These early collections of Canby, Curtiss, Harbison, etc. show the same variation as the collections made by the writer in 1953.

The shrubs are two to seven feet tall and have a diameter of one half to two inches at the base. They form the dominant low shrub layer beneath a stand of mixed hardwoods and loblolly pine. The community is on the northeast-facing slope of one of the outlying ridges around Stone Mountain. This population of buckeyes covers an area of approximately one acre. The reason for the great attraction of the population is the striking and very apparent variation in a number of characters. The leaves are glabrous to densely tomentose, the shape and size of the inflorescence varies from short and broad to long and narrow, and the flower color particularly has an amazing array of combinations. One extreme in flower color is the red of both calyx and corolla. The other extreme is a pale yellow or often greenish-yellow in both calyx and corolla. Between these extremes one can find a flower to match nearly any shade and with the calyx usually more red than the corolla. The flowers on a single inflorescence are alike except for the variation in the color of the upper-petal claws which are yellow prior to anthesis and brown or orange after anthesis—regardless of general perianth color. Time of flowering also varies. During April when certain shrubs are in bloom, others right next to them are just beginning to blossom or leaf out and showing only the very small, crowded, green buds of the inflorescence.

Random samples of the population were collected on April 8, 1953 (Hardin No. 107). At that time nearly two-thirds of the shrubs in the population were in full bloom. Just over a month later (May 11th) another similar sample was collected (No. 129) at the same spot but from the shrubs then in bloom.

At the time of collection, speculations as to what this variation meant were based merely on general observations. There was no explanation for the variation in pubescence but it was of interest since both extremes were present and formed the basis for Sargent's designation of the two varieties. Also pubescence had been the basis for the distinction between *A. pavia* L. and *A. discolor* Pursh. The color variation was of particular interest since *A. pavia* of the Coastal Plain is typically red, and *A. sylvatica* Bartr. of the Piedmont is typically yellow.

Could this be a hybrid swarm between these two species? *Aesculus pavia* was certainly not found near here. The long flowering period certainly would include the typical flowering dates of these two species. But, the early-blooming shrubs were not predominately red-flowered. Of course this would not necessarily be expected.

Later, after closer examination of the pressed specimens, it was realized that another "key character" varied. This was the presence of stalked glands on the margin of the petals. *Aesculus pavia* typically has such glands; *A. sylvatica* is villous on the margins. Both conditions were found (but not necessarily with the corresponding perianth colors) and also an intermediate form with both hairs and glands on the margin. Thus it was impossible to identify to either species many of the specimens from this population.

In connection with a monographic study of *Aesculus* by the writer, these population samples have been analyzed using the techniques described by Anderson (1949). Each population sample consisted of 20–50 specimens. Every specimen was measured and scored for the following five characters: calyx length, stamen length, perianth color, pubescence of petal margin, and relationship of stamen length and lateral petal length (i.e., whether the length of the stamen is greater or less than that of the lateral petals). The first two characters are used as the coordinates of the graph, and the other characters are represented by symbols (Fig. 1). The data obtained from the analysis of the Stone Mountain population are presented graphically as pictorialized scatter diagrams in Fig. 1, graphs B and C.

A close examination of the behavior of individual characters in this population (as shown in the scatter diagrams) indicates influence from two directions. Using the method of extrapolated correlates (Anderson, l.c.), one can possibly extrapolate to the two hypothetical introgressants. Identification of these hypothetical species results in the names of *A. pavia* and *A. sylvatica*. As a check of the two suspected introgressing species, population analyses were made for *A. pavia* (Hardin No. 105 from Appling County, Georgia) and for *A. sylvatica* (No. 117 from Clarke County, Georgia). Results of the analyses of these populations

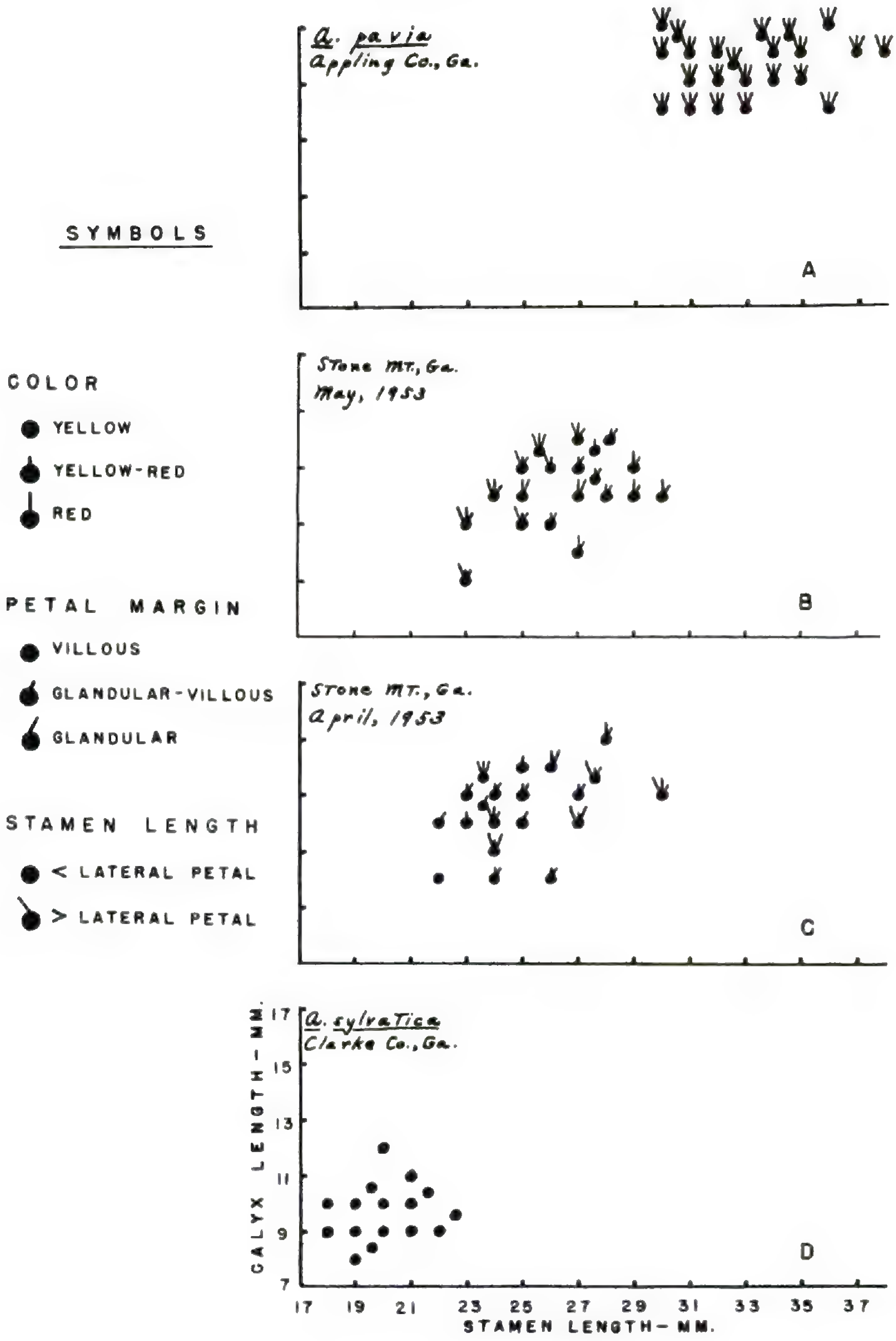

Fig. 1. Pictorialized scatter diagrams of buckeye populations, showing *A. pavia*, *A. sylvatica* and a hybrid swarm at Stone Mountain, Georgia.

are shown in Fig. 1, graphs A and D. It seems obvious from this series of four scatter diagrams that the Stone Mountain population is a hybrid swarm between the suspected *A. pavia* and *A. sylvatica*.

Although every character illustrated has apparently been influenced through hybridization, there is a tendency for the characters of the species to stay together. For example, the red color and the presence of glands on the petal margins are usually closely correlated. With respect to the stamen length vs. calyx length, the entire population is intermediate between the introgressing species. There is, however, relatively little difference between the early- and late-blooming members of the population. If anything, the earlier flowering forms are slightly closer to *A. sylvatica* and more variable. Factors affecting time of flowering appear independent of species differences. Populations of the pure species often show this same variation in time of flowering.

Size and shape of inflorescences seem to be variable in many populations whether hybrid swarms or of pure species. The same variation may even occur on a single shrub (Hardin, 1956). This variation certainly does not seem to be due to hybridization. The variation in pubescence is more or less characteristic of both *A. pavia* and *A. sylvatica*. The variation in this Stone Mountain population is no more extreme than that found in any population of either species. In both species the glabrous form is more often found (at least in eastern populations); however, in nearly every population, slightly tomentose and extremely tomentose leaves are commonly found. These pubescent forms are not recognized by the writer as distinct taxa.

The geographical position of this population is of interest since *A. pavia* is typically found only on the Coastal Plain—some 80–90 miles southeast of Stone Mountain. This hybrid swarm is in the center of the range of *A. sylvatica*. Recent studies of other populations in Georgia and hundreds of herbarium sheets show that *A. pavia*, or at least *A. sylvatica* with a very strong influence of *A. pavia*, extends up the rivers from the Coastal Plain well into the Piedmont. Hybrid populations, for example, are common along the Savannah River far up into northwestern South Carolina. Also the Chattahoochee, Oconee,

Ocmulgee and Yellow Rivers, among others, have served as routes for this apparent gene flow. The population at Stone Mountain is only a few miles west of the Yellow River, so it does not seem too strange to find such a hybrid swarm at this locality in Georgia. It is surprizing, however, that *A. pavia* has had such a very strong influence upon *A. sylvatica* even though it is a considerable distance from the typical range and habitat. Does this indicate that *A. pavia* once was regularly on the Piedmont during times when the Coastal Plain was submerged? There is other evidence from which this may be inferred.

Many such hybrid swarms exist throughout the areas of overlap between species ranges. H. K. Svenson (1941) called attention to one such population in Sequatchie Valley of Tennessee. This population has been seen by the writer and is similar in many ways to the one at Stone Mountain. Introgression is often more the rule than the exception in certain areas. Many populations showing introgression between *A. glabra* and *octandra*, *A. octandra* and *sylvatica*, *A. pavia* and *sylvatica*, and to a lesser extent *A. glabra* and *pavia*, have been found. Certainly not all populations in regions of overlap are hybrid swarms, but rather they often show a heightened variation in the parental species. Analyses of these other populations and a more detailed discussion of introgression within the buckeyes will be reported later.

This Stone Mountain population is a graphic illustration of what has been taking place in many localities within and between species populations of the buckeyes of eastern North America. It is also an illustration of why there has been so much confusion in the taxonomy and field identification of these trees and shrubs. To be sure, within this one population at Stone Mountain there are some shrubs which would be placed without question as *A. sylvatica* (e.g., the types of *A. georgiana* and var. *pubescens*). The disturbing fact, though, to the floristic or herbarium systematists and the field naturalists of the Atlanta area, is that the majority of these shrubs at Stone Mountain cannot be "keyed out" in any floristic manual or guide.

A complete understanding of the buckeyes must include

such intermediate forms and the realization that they are of hybrid origin. Likewise, any usable dichotomous key written for the buckeyes of eastern North America should include these hybrid forms in some way.—DEPARTMENT OF BOTANY, UNIVERSITY OF MICHIGAN.

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NOTES ON THE CLEISTOGAMOUS SPECIES OF POLYGALA IN SOUTHEASTERN UNITED STATES

CHARLES W. JAMES

In Blake's (1924) monograph of the *Polygalaceae*, two cleistogamous-flowered species of *Polygala* were included for the southeastern United States: the wide-ranging *P. polygama* Walt., known from Florida to Texas and as far north as Minnesota, Ontario, Quebec and Nova Scotia, and *P. lewtonii* Small, an endemic of the sand-scrubs of central Florida. Earlier, Blake (1915) described *P. polygama* forma *obovata*, but later (1924) did not consider it, or any other infraspecific taxon of *P. polygama*, worthy of taxonomic recognition. Subsequently, only one other species, *P. aboriginum* Small (1926), has been described. This is a poorly known "species" from the east coast of Florida (Volusia County).

In the present paper, *P. lewtonii* Small is recognized as a valid species. *P. polygama* Walt. forma *obovata* Blake is elevated to the rank of species and is renamed *P. crenata*. *P. aboriginum* Small is regarded as a synonym of *P. polygama* Walt., as is *P. polygama* Walt. var. *obtusata* Chod. The study is based on specimens from the Florida Agricultural Experiment Station Herbarium (FLAS), the Gray Herbarium (GH) and the New York

Botanical Garden (NY). The assistance of the curators of these institutions is kindly acknowledged.

Seeds are set in both cleistogamous and normal flowers in each of the three species. Whether or not the production of seeds in the cleistogamous flowers is advantageous to survival or has contributed to the evolution of these species is not known. *P. lewtonii* and *P. crenata* exhibit very little variation, providing little reason to believe that local segregates are being produced or maintained through cleistogamy. However, this does not eliminate the possibility that these two species may themselves have evolved as such segregates from *P. polygama*. The latter species presents considerable variation (in length of racemes, and in the size of floral parts and seeds), although this is to be expected to some degree because it occupies so many ecologically different regions.

The duration of these plants has been a point of question. *P. polygama* and *P. lewtonii* have been described as biennials and biennials (or annuals?), respectively. In this study, plants of all three species from many localities were observed to have remnants of previous flowering shoots which indicate that they are perennials. Southward, the shoots frequently appear to persist throughout the winter, giving rise to new ones the following spring.

The seeds and capsules are of considerable importance in the classification of members of the genus. These structures furnish the only known diagnostic features within this species group.

Key to the Species

Capsules oblong, twice as long as wide; seeds cylindric, the upper part of the arils bony like the caruncle . . . . 1. *P. lewtonii.*

Capsules oval, less than twice as long as wide; seeds ovoid to cylindric-ovoid, the arils membranaceous throughout.

- Margin of capsule with narrow, thin, crenate wing; caruncle with flexible hairs longer than those on the body of seed, the arils connivent . . . . 2. *P. crenata.*
- Margin of capsule merely ridged, entire (rarely wing-like); caruncle with short, straight, bristly hairs, no longer than those on body of seed, the arils usually divergent . . . . 3. *P. polygama.*

1. **Polygala lewtonii** Small, Bull. Torr. Bot. Club **24:** 140. 1898. TYPE: Frostproof, Polk Co., Florida, *Lewton*, 19 March 1894 (NY). HABITAT AND DISTRIBUTION: sand-scrub areas of central Florida.—HIGH-

LANDS Co.: e. of Sebring, *Garrett 140* (FLAS); e. of Sebring, *Small 9574* (NY); e. of Sebring, *Small 11145* (FLAS, GH, NY). LAKE Co.: near Eustis, *Hunnewell 8689* (GH). MARION Co.: Ocala National Forest, *Mather*, 30 March 1949 (FLAS). ORANGE Co.: Table-top Hill, nw. of West Apopka, *Harper 15* (GH, NY). POLK Co.: Lake Wales, *King*, 28 Dec. 1948 (FLAS); Lake Davenport, *McFarlin*, 3 April 1928 (FLAS); Crooked Lake, *McFarlin*, 1925 (FLAS); Loughman, *West*, 8 May 1928 (FLAS).

Although the Highlands and Marion County citations represent an extension of range, *P. lewtonii* is nevertheless known only from the sand pine[1]-scrub type of community. This species appears to be a true endemic of the region and not merely an ecological variant of *P. polygama*. Such a belief is substantiated not only by the strong morphological features of the seeds and capsules, but by the fact that typical *P. polygama* has been collected from this same kind of habitat (*Brass 14703*, Highlands Co., Fla., GH), and the diagnostic features have remained distinctive. However, the extent to which *P. polygama* occurs within the habitat and range of *P. lewtonii* cannot be satisfactorily determined from the available collections and their data. It is known that *P. polygama* occurs in Lake and Orange Counties, also within the range of *P. lewtonii*, but in a quite different habitat (low, wet pine lands), unusual for this species.

2. **Polygala crenata** James, nom. et stat. nov.[2] Based on *Polygala polygama* Walt. forma *obovata* Blake, RHODORA **17:** 201. 1915. TYPE: New Orleans, Orleans Parish, Louisiana, *Drummond 38*, 1832 (BM). Isotype examined (GH). PARATYPE: swampy places between Tallahassee and St. Marks, Florida, *Rugel 106*, April-May 1843 (BM). Leaves from paratype examined (GH).

Stems erect, typically simple, solitary to many from a perennial root, (1.2–)2–3(–3.5) dm. high, glabrous, bearing racemes of cleistogamous flowers at the base or from the axils of the leaves; leaves glabrous, alternate, those of older shoots obovate, 1–2(–2.3) cm. long, 3–8 mm. wide, leaves of the flowering shoots smaller, obovate to elliptic, (0.5–)0.8–1.3 (–1.7) cm. long, (2–)3–5(–9) mm. wide, the bases cuneate, the apices rounded, obtuse or the upper leaves even acute, sometimes cuspidulate; racemes pyramidal, becoming cylindric, 1–1.5 cm. thick, the axis becoming 7–10(–15) cm. long, peduncles 1–2(–2.5) cm. long; bracts ovate, glabrous, deciduous, ca. 1 mm. long; pedicels becoming 3–4 mm. long; flowers light to deep pink; sepals oval to ovate, acute or obtuse, ca. 1.3–2 mm. long, glabrous; wings 4–5 mm. long, clawed at base, the blade orbicular to oval or oval-obovate, glabrous; keel 3–4 mm. long; capsule

[1] *Pinus clausa.*

[2] Neither "obovata" nor "blakeana" is available as a specific epithet.

oval, 2–2.5 mm. long and about as wide at base, apex notched, the margin narrowly winged, the wing crenate; seeds 2, ca. 2 mm. long, mostly less than 1 mm. wide, ellipsoid-ovate, but sharp pointed at base, pilose, the hairs appressed, caruncle cylindrical, bearing relatively long (some over 0.5 mm.) flexible hairs at apex, arils oval, connivent, cellular, appressed to seed, nearly 1 mm. long, less than half the length of seed.

Habitat and Distribution: low pine barrens of the Gulf Coast, from northwestern Florida into Louisiana.—**Florida.** Bay Co.: Lynn Haven, *Banker 3518* (ny); Lynn Haven, *Knight*, 21 May 1940 (flas); Calloway, *Hood 1685* (flas). Calhoun Co.: 1 mi. n. of Blountstown, *Hood 1567* (flas). Dixie Co.: sw. of Cross City, *Baker*, 21 April 1939 (flas). Franklin Co.: Apalachicola prairies, *Small 11254* (flas, ny). Gulf Co.: s. of Dalkeith, *Moldenke 1149a* (ny); n. of the Apalachicola-Panama Canal, *Small 11238* (ny). Jackson Co.: near Sneads, *Harper 78* (gh, ny); Cypress, *Knight*, 22 April 1941 (flas). Leon Co.: 10 mi. s. of Tallahassee, *Palmer 38489* (gh). Washington Co.: near Brock, *Hood 1960* (flas). **Mississippi.** Harrison Co.: Biloxi, *Tracy 5181* (ny). Jackson Co.: Ocean Springs, *Demaree 28659* (Gulf Coast Research Laboratory, Ocean Springs, Miss.); Kreole, *Demaree 34884* (gh); Ocean Springs, *Demaree 35053* (gh); n. of Cicoria's, *Diener 10* (Gulf Coast Research Laboratory). **Louisiana.** Orleans Parish: New Orleans, *Ingalls* (ny).

Since *P. polygama* Walt. forma *obovata* Blake was based primarily on leaf-shape, it is not surprising that plants in various sections of the range of *P. polygama* have been identified as this form. Plants with obovate leaves are common in at least three areas: the Gulf Coast (including the specimens upon which forma *obovata* was based); Arkansas and Oklahoma; and the mountainous parts of Georgia, South Carolina, North Carolina, Virginia, and Maryland. Whether or not the plants of the latter two areas deserve taxonomic recognition is not clear. This could not be determined from the mostly immature specimens at hand. However, the plants of the Gulf Coast (*P. crenata*) differ significantly from *P. polygama* in features other than mere leaf shape. They are typically smaller, erect, sparsely if at all branched, and have shorter leaves. The capsules are clearly winged, and the wings are conspicuously crenate. The seeds are smaller, with a straight caruncle bearing long, flexible hairs. In addition, *P. crenata* seems to be a species of the low, frequently wet, acid pine barrens, whereas *P. polygama* is usually found in drier, well-drained sites. Most of the specimens examined from the Gulf Coast are *P. crenata*, but the range of *P. polygama* also includes parts of this area. Although

Nash's collection (204, Lake Co., Fla.) of *P. polygama* somewhat resembles *P. crenata* in vegetative characters, no specimen was seen which could be classed as an intermediate between these two species.

3. **Polygala polygama** Walt. Fl. Carol. 179. 1788. (No specimen of this taxon is present in the Walter Herbarium.) *P. polygama* Walt. var. *obtusata* Chod. Mém. Soc. Phys. Genève 31 (2)²: 280. 1893. *P. polygama* Walt. var. *abortiva* Chod. l. c. *P. polygama* Walt. forma *albiflora* House, Bull. N. Y. State Mus. **45:** 243. 1923. *P. aboriginum* Small, Torreya **26:** 92. 1926. TYPE: "Hammock, Turtle Mound," Volusia Co., Fla., *Small*, 24 May 1926 (NY). *P. polygama* Walt. var. *ramulosa* Farwell, Am. Mid. Nat. 11: 63. 1928.

After Blake (1924) relegated var. *obtusata* to the synonymy of *P. polygama*, Fernald (1940) apparently was the first to reinstate it. However, I have been unable to correlate the morphological features upon which this variety was described with any geographical area and, therefore, it is left in the synonymy of *P. polygama*. The character upon which Fernald heavily relied in distinguishing it was the relatively condensed inflorescence. This, in general, characterizes the plants from the northernmost states and Canada, but southward the racemes may or may not be condensed, even in the same population. Temperature alone could be the limiting factor in the elongation of the inflorescence in the northern plants, whereas in the southern plants it could be a reflection of one or several other critical environmental conditions.

Variety *abortiva* was shown by Robinson (1900) to be the autumnal form of typical *P. polygama*. The same phase has also been described as var. *ramulosa*. This growth form is characterized by recurved racemes of cleistogamous flowers which are borne in upper leaf axils rather than near the base of the plant.

Small distinguished *P. aboriginum* from *P. polygama* chiefly on the relatively short pedicels and wings, quantitative characters which vary considerably in this complex. A series of specimens collected by Weber (near Fairbanks, Alachua Co., Fla., 22 April 1928, FLAS), demonstrates very well the sporadic occurrence of the reduced wings in a single population. Since this taxon is neither a strongly differentiated morphological unit, nor a geographical segregate within the species, it seems

that the rank of forma would be sufficient for it if a formal taxonomic category were shown to be desirable. GRAY HERBARIUM, HARVARD UNIVERSITY.

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REVIEW OF THE GENUS CLADONIA IN THE DISTRICT OF COLUMBIA AND VICINITY

S. F. BLAKE

IN 1931 the late Charles A. Robbins and the writer published[1] an annotated, keyed list of the species of reindeer-moss and related forms then known from the District of Columbia region, a circle of approximately 15 miles radius about the Capitol in Washington, thus including areas in adjacent Maryland (in Montgomery and Prince Georges Counties) and Virginia (Arlington and part of Alexandria and Fairfax Counties). In those days specific distinctions in *Cladonia* were founded mostly on morphological characters with frequent assistance from the color changes brought about by treatment with caustic potash, in some cases supplemented by chloride of lime. Since that time more and more diagnostic importance has come to be attributed to the chemical constituents of the species of *Cladonia*, determined in some cases by the color changes induced by the application of new chemicals, particularly paraphenylenediamine, in others by the shape and color of the microcrystals formed by the evaporation of a solution obtained by extracting dried material of *Cladonia* with acetone or chloroform, then treating with a mixture of glycerine and glacial acetic acid or some similar compound.

[1] Cladonia in the District of Columbia and vicinity. RHODORA **33:** 145–159. pl. 210–212. 1931.

In recent years the leader in the chemical investigation of species of *Cladonia* as well as other lichens has been the Japanese botanist Yasuhiko Asahina. In this country Dr. Alexander W. Evans, for a full quarter-century the leading American student of the genus, has contributed a long series of critical papers and several state *Cladonia* floras based on the most careful study of very extensive collections, in which full consideration has been given to the chemical and microcrystalline characters of the species investigated. All the critical material on which the present paper is based has been named by Dr. Evans and his identifications have been followed throughout, although a phanerogamic botanist can hardly avoid having reservations regarding the specific distinctness of forms distinguished essentially by chemical reactions alone.

Since the 1931 paper was published extensive collections of *Cladonia* have been made by Emery C. Leonard of the U. S. National Herbarium in the District of Columbia region, particularly on Plummers Island, Montgomery County, Maryland,[2] and at a locality, the Patuxent Research Refuge, about 5 miles southeast of Laurel, Prince Georges Co., Maryland, 6 miles east of Beltsville, and approximately 17 miles northeast of the Capitol and so slightly outside the limits adopted in the earlier paper; and some earlier collections by him have been examined. Records from the last-named locality, including two species not at present known elsewhere in the region, have been included in the present list. A few additional specimens have been collected in the region by the writer. All of Mr. Leonard's and my own specimens here recorded, as well as numerous older specimens belonging to critical species, have been identified by Dr. Evans, to whom my best thanks are due for continual assistance of this sort during the past twenty-five years. My whole *Cladonia* herbarium has been deposited in the National Fungus Collections at Beltsville, Md.

Records not given in the 1931 list are distinguished by the addition of the collector's name and date, except that when, as in the case of *C. caroliniana* and *C. grayi*, a specific name has been changed and new infraspecific categories appear, no details are given for them if they are based on material already recorded

[2] E. C. Leonard and E. P. Killip, Natural History of Plummers Island, Maryland. VIII. Lichens. Proc. Biol. Soc. Washington 52: 23–26. 1939. (Cladoniaceae, p. 25.)

in the 1931 list. Localities are repeated from the earlier list for all species known from not more than three or four localities. The locality "in vicinity of Landover near Bladensburg, Maryland," at which I collected in the '20's several rarities, one of which (*C. floerkeana*) was and still is known from no other spot in the region, has now been obliterated by building operations.

The original list included 36 species, raised to 38 in the present catalog. Four species have been omitted as wrongly identified (*C. coccifera*, *C. impexa*, *C. mitis*, and *C. polycarpia*), six have been added (*C. cryptochlorophaea*, *C. conista*, *C. didyma*, *C. grayi*, and *C. submitis*, as well as *C. atlantica* which is equivalent to some of the named forms of *C. squamosa* in the earlier list), and the names of six have been changed. Two of the additional species are segregates of *C. chlorophaea* and a third (*C. conista*) is intermediate between that species and *C. fimbriata*.

1. **Cladonia rangiferina** (L.) Web. Rare and local; near Prospect Hill, Fairfax Co., Va.; near Lanham, and at Burnt Mills, Md. In addition to the typical form, f. *crispata* Coem. has been collected.

2. **C. sylvatica** (L.) Hoffm. Scarce; recorded in 1931 from near Landover, near Lanham, at Burnt Mills, and Suitland bog, Md., and near Mt. Vernon, Va., and since collected at Patuxent Research Refuge, near Laurel, Md., by Leonard. In addition to the typical form, f. *pygmaea* Sandst. and f. *sphagnoides* (Floerke) Oliv. have been collected.

3. **C. subtenuis** Des Abbayes. (*C. tenuis* (Floerke) Harm. and *C. impexa* Harm. of 1931 list.) Abundant. Forma *condensata* (Floerke) Sandst. and f. *laxiuscula* (Del.) Sandst. of *C. impexa*, recorded in the 1931 list, can be expunged, and the following named form added: *C. subtenuis* f. *cinerascens* (Des Abbayes) Evans: on rocks, near Prospect Hill, Fairfax Co., Va., 1925, *Blake;* sandy pine woods, vicinity of Hyattsville, Md., 1924, *Blake.*

[*C. mitis* Sandst. The single collection on which the 1931 record was based, from near Great Falls, Va., has been examined by Dr. Evans; the specimen is P +, and thus not *C. mitis* as now understood, but it is in too fragmentary condition to be identified. The species should be expunged from the list.]

4. **C. submitis** Evans. Along fence rows, lower end of Patuxent Research Refuge, near Laurel, Md., 1946, *Leonard 21871* and *21872 C.*

5. **C. papillaria** (Ehrh.) Hoffm. Fairly common. Represented by four forms: f. *molariformis* (Hoffm.) Schaer, f. *papillosa* Fr., f. *prolifera* (Wallr.) Schaer (this from Patuxent Research Refuge near Laurel, Md., 1956, *Leonard & Hotchkiss 22351*), and f. *stipata* Floerke.

6. **C. vulcanica** Zolling. f. **minor** Robbins. Rare: Arlington, Va., Prospect Hill, Fairfax Co., Va., Riggs Mills near College Park, Md., and "District of Columbia."

7. **C. didyma** (Fée) Wain. On rotten log in woods, northwest of the buildings, Patuxent Research Refuge, near Laurel, Md., 1946, *Leonard 21736.*

8. **C. floerkeana** (Fr.) Floerke var. **intermedia** Hepp. At a single

locality in vicinity of Landover, near Bladensburg, Md., now destroyed by building operations.

9. **C. bacillaris** (Ach.) Nyl. Common. Most of the material collected is referable to f. *clavata* (Ach.) Wain.

10. **C. macilenta** Hoffm. f. **styracella** (Ach.) Wain. Rare.

[*C. coccifera* (L.) Willd. Recorded in the 1931 list from a single locality in vicinity of Landover, near Bladensburg, where represented by var. *stemmatina* (Ach.) Wain. and var. *phyllocoma* Floerke. Both collections now referred by Dr. Evans to *C. pleurota;* the specimen called var. *phyllocoma* enters var. *frondescens* of that species.]

11. **C. pleurota** (Floerke) Schaer. Not common. In addition to the typical form, the following three forms occur: var. *cerina* (Nagel) Th. Fr., f. *decorata* (Wain.) Evans, and var. *frondescens* (Nyl.) Oliv.

12. **C. cristatella** Tuck. Abundant. Represented by the following forms: f. *beauvoisii* (Del.) Wain., f. *ochrocarpia* Tuck., f. *squamulosa* Robbins, and f. *vestita* Tuck., of the 1931 list; and in addition f. *pleurocarpa* Robbins (Patuxent Research Refuge, near Laurel, Md., 1946, *Leonard 21599* in part) and f. *ramosa* Robbins (clayey soil near edge of pine woods, Battery Park near Bethesda, Md., 1925, *Blake*).

13. **C. incrassata** Floerke. (*C. paludicola* (Tuck.) Merrill of 1931 list.) Rare; Arlington, Va., and vicinity of Landover, near Bladensburg, Md.; also Franklin Park near McLean, Va., 1931, *Leonard 15926 b*. Forma *squamulosa* (Robbins) Evans has been collected at Franklin Park, near McLean, 1932, *Leonard 16214*.

14. **C. uncialis** (L.) Web. Fairly common. The following named forms have been collected: f. *dicraea* (Ach.) Wain., f. *humilior* Fr. (this from Prospect Hill, Fairfax Co., Va., 1925, *Blake*), f. *obtusata* (Ach.) Nyl., and f. *subobtusata* Arn.

15. **C. caroliniana** (Schwein.) Tuck. (*C. boryi* Tuck. of 1931 list.) Rare; Upton Hill, Arlington Co., Va.; vicinity of Landover, near Bladensburg, Md; and southeast of Decatur Heights, Bladensburg, 1931, *Leonard 15949*. The material includes specimens referred by Dr. Evans to the following forms: f. *dilatata* Evans, f. *fibrillosa* Evans, and f. *prolifera* Evans; also f. *tenuiramea* Evans (Patuxent Refuge near Laurel, Md., 1956, *Leonard 22338, 22341a, 22352*).

16. **C. floridana** Wain. Known from only two localities, one (now destroyed) in vicinity of Landover, near Bladensburg, Md., where common, the other near Lanham, Md. The following forms occur beside the typical form: f. *brachiata* Robbins, f. *elegans* Robbins, f. *esquamosa* Robbins.

17. **C. delicata** (Ehrh.) Floerke f. **quercina** (Pers.) Wain. Fairly common.

18. **C. furcata** (Huds.) Schrad. Fairly common. The following varieties and forms occur: var. *pinnata* (Floerke) Wain. f. *foliolosa* (Del.) Wain., var. *pinnata* f. *turgida* (Scriba) Sandst. (Plummers Island, Md., 1936, *Leonard 2606* and *2607*), var. *racemosa* (Hoffm.) Floerke, var. *racemosa* f. *squamulifera* Sandst. (Plummers Island, 1931–42, numerous collections by Leonard and others), var. *racemosa* f. *subclausa* (Sandst.) Evans.

19. **C. squamosa** (Scop.) Hoffm. Common. The following forms occur: f. *denticollis* (Hoffm.) Floerke, f. *levicorticata* (Sandst.) Evans (Patuxent Research Refuge near Laurel, Md., 1956, *Leonard & Hotchkiss* 22382), f. *phyllocoma* (Rabenh.) Wain., f. *sessilis* Robbins, f. *squamosissima* Floerke.

20. **C. atlantica** Evans. (*C. squamosa* f. *levicorticata* m. *rigida* and m. *pseudocrispata* and f. *turfacea* of 1931 list). Fairly common. In addition

to the typical form, f. *ramosa* Evans and f. *subsimplex* Evans (the latter from Patuxent Research Refuge near Laurel, Md., 1946, *Leonard 21832*) have been identified.

21. **C. caespiticia** (Pers.) Floerke. Fairly common.

22. **C. apodocarpa** Robbins. Rather common.

23. **C. capitata** (Michx.) Spreng. f. **imbricatula** (Tuck.) Evans. (*C. mitrula* of 1931 list.) Very common.

24. **C. subcariosa** Nyl. Very common. To the forms reported in 1931, f. *epiphylla* Robbins, f. *evoluta* Wain., f. *pallida* Robbins, and f. *squamulosa* Robbins, should be added f. *ramosa* Dix (Beltsville, Md., 1949, *Blake*).

[*C. polycarpia* Merrill. To be deleted. The single scanty collection from Great Falls, Va., on which the 1931 record was based is indeterminable, but is not *C. polycarpia*, *C. subcariosa*, or *C. clavulifera*.]

25. **C. clavulifera** Wain. Rather scarce. In addition to the typical form (which has been named f. *nudicaulis* Evans), and f. *subvestita* Robbins, f. *pleurocarpa* Robbins has been recorded (Plummers Island, Md., 1933, *Leonard 2223*).

26. **C. brevis** Sandst. (*C. alpicola* var. *karelica* of 1931 list.) Known only from a single somewhat unsatisfactory record, that of two specimens collected by Lehnert in "District of Columbia" and mounted with others of *C. capitata* and *C. subcariosa*. Dr. Evans informs me that he has southern material from Virginia, West Virginia, and North Carolina; all his Virginia specimens come from counties in the mountains except for one from King and Queen County in Tidewater Virginia.

27. **C. pyxidata** (L.) Fr. Scarce. Represented by two named forms, f. *lophyra* (Ach.) Rabenh. and f. *simplex* (Ach.) Harm., both belonging under var. *neglecta* (Floerke) Mass.

28. **C. chlorophaea** (Floerke) Spreng. Although reported in the 1931 list as the commonest and most variable *Cladonia* in the region, *C. chlorophaea* as now restricted by the excision of *C. grayi* turns out to be extremely scarce. All my own specimens, referred to 9 named forms by Robbins, prove to belong to *C. grayi*, a morphologically almost identical species which he did not distinguish from *C. chlorophaea*. The only specimens from the region which Dr. Evans finds referable to *C. chlorophaea* (f. *simplex* (Hoffm.) Arn.) are the following: Near Saegmiller's place, Alexandria Co., Va., 1917, *Mary F. Miller* (locality dubious, perhaps in Arlington Co.); between Anacostia and Twining City, D. C., 1918, *Leonard 134 p. p.*

29. **C. grayi** Merrill. Abundant, practically all the material on which the 1931 listing of *C. chlorophaea* was based now being referred to this species, which scarcely differs except in chemical reaction. In addition to the typical form, Evans identifies the following: f. *carpophora* Evans, f. *cyathiformis* Sandst., f. *squamulosa* Sandst. The species was first recorded by Leonard and Killip in their Plummers Island list.

30. **C. cryptochlorophaea** Asahina. Sligo Creek, Montgomery Co., Md., 1918, *Leonard* 62 p. p.; Plummers Island, Montgomery Co., 1938, *Leonard 2759*.

31. **C. conista** (Ach.) Robbins f. **simplex** Robbins. Sligo Creek, Montgomery Co., Md., 1918, *Leonard* 62 p. p.; vicinity of Great Falls, Va., 1924, *Killip 12447*.

32. **C. coniocraea** (Floerke) Sandst. Fairly common. Three forms occur: f. *ceratodes* (Floerke) Wain., f. *phyllostrota* (Floerke) Wain., f. *truncata* (Floerke) Wain.

33. **C. pityrea** (Floerke) Fr. Scarce; Plummers Island, Md., near Chevy Chase, Md., and near Great Falls, Va. Two forms are known: f. *hololepis* (Floerke) Wain. and f. *subacuta* Wain., both belonging under var. *zwackhii* Wain.

34. **C. mateocyatha** Robbins. Scarce. Besides the typical form, f. *squamulata* Robbins has been collected.

35. **C. verticillata** (Hoffm.) Schaer. Fairly common; the following forms occur: f. *apoticta* (Ach.) Wain., f. *evoluta* (Th. Fr.) Stein, f. *phyllocephala* (Flot.) Oliv., and f. *phyllophora* (Ehrh.) Flot. (the last from Plummers Island, Md. 1907, *B. Fink 103* in part).

36. **C. robbinsii** Evans. (*C. foliacea* var. *alcicornis* of 1931 list.) Known only from rocks at Great Falls, in both Maryland and Virginia.

37. **C. strepsilis** (Ach.) Wain. Common. Three forms have been collected: f. *coralloidea* (Ach.) Wain, f. *glabrata* Wain., f. *subsessilis* (Wain.)S andst.

38. **C. piedmontensis** Merrill. Common. The following forms occur: f. *lepidifera* (Wain.) Robbins, f. *obconica* Robbins, f. *phyllocoma* Robbins, f. *squamulosa* Robbins.—HORTICULTURAL CROPS RESEARCH BRANCH, AGRICULTURAL RESEARCH SERVICE, U. S. DEPARTMENT OF AGRICULTURE, BELTSVILLE, MARYLAND.

MISCELLANEOUS CRUCIFERAE OF MEXICO AND WESTERN TEXAS

REED C. ROLLINS

MOST taxonomists recognize the fact that the flora of certain areas of Mexico and adjacent United States is very inadequately known, but there is only a limited opportunity to help with the task of doing something about it. The lack of study collections is the primary source of difficulty. For several years I have known about a number of new species in the Cruciferae from the area, but I have refrained from describing them because of inadequate material. Now, with more material at my disposal, a small group of these has received attention again, and they are described below.

Thelypodium Paysonii Rollins, sp. nov.

Herbaceous annual or biennial; basal leaves not present; stems branched, densely hirsute with long spreading simple trichomes, 2–4 dm. long; cauline leaves petiolate, pinnate, with the lobes dentate, 3–6 cm. long, 1–3 cm. wide, pilose along petiole and main vein, lobes mostly glabrous, narrowly oblong, markedly dentate; pedicels slender, glabrous, divaricately ascending in flower, spreading at right angles to rachis and slightly curved downward in fruit, 6–9 mm. long; buds broadly clavate; sepals whitish, glabrous, non-saccate, oblong, 3–4 mm. long; petals white, with a long claw, blade spatulate, 1–1.5 mm. across, petals 5–6 mm. long,

spreading at anthesis, claw very slender, expanded toward base, pubescent with glandular trichomes below; stamens exserted, spreading at anthesis, nearly equal, 6–7 mm. long, filaments slightly expanded toward base, pubescent with glandular trichomes below; siliques straight to slightly curved, divaricately ascending when young, widely spreading and pendulous at maturity, stipitate, thickish, only slightly flattened parallel to septum, glabrous, 4–6 cm. long, 1.5–2 mm. wide; valves with a central nerve extending full length, secondary nerves forming a network and less prominent; gynophore 0.5–2 mm. long; styles slender, 1.5–2 mm. long, unexpanded at apex; seeds wingless, immature. Fig. 1, A—C.

Herba annua vel biennis; caulibus ramosis hirsutis; foliis radicalibus ignotis; foliis caulinis petiolatis, sparse pilosis pinnatis, 3–6 cm. longis, 1–3 cm. latis, pedicellis floriferis divaricatis, pedicellis fructiferis patentibus; sepalis albidis glabris nonsaccatis patentibus oblongis 3–4 mm. longis; petalis albis patentibus spathulatis 1–1.5 mm. latis, 5–6 mm. longis; siliquis stipitatis linearibus patentibus glabris, subteretibus 4–6 cm. longis, 1.5–2 mm. latis, stylis tenuissimis 1.5–2 mm. longis; seminibus immaturis exalatis.

Type in the Gray Herbarium collected in Cañon de Jara, east of Socorro; lower part of canyon near its mouth, about 30 km. west of Cuatro Cienegas, Coahuila, Mexico, Feb. 1–15, 1941, *Albert H. Schroeder 12*. Additional specimens examined: rocky soil, Torreón, Coahuila, 1903, *C. A. Purpus 130* (GH); Sierra de Parras, Coahuila, March, 1905, *C. A. Purpus 1028* in part (GH).

The Purpus specimen from Torreón was early identified by T. S. Brandegee as *Cardamine*, but when I first encountered it some years ago, I was sure it did not belong in that genus. No flowers are present on the specimen, but the stipitate siliques suggested *Thelypodium* or a nearly related genus. Payson recognized the single plant of *Purpus 1028*, mounted with *Sibara Viereckii* var. *Endlichii* on a single sheet, as a new species, but failed to describe it. The Schroeder specimen is complete except for the basal portion and shows that the species is definitely related to *Thelypodium texanum*. Both of these species and *T. tenue*, described below, have pinnately lobed leaves, contrasting in that respect with *T. Wrightii* of the same species-group, which has entire or dentate leaves. The siliques of *T. texanum* are ascending, whereas they are widely spreading to pendant in *T. Paysonii*. The new species has densely pilose or hirsute stems with similar trichomes extending to the petioles and main veins of the leaves while plants of *T. texanum* are completely glabrous. In *T. Paysonii*, the styles are very slender and the lower portions of the petals and filaments are well

FIG. 1. *Thelypodium Paysonii* Rollins. A—habit × ½. B—flower × 6. C—silique × 1. Drawings from the type by B. Tugendhat.

covered with glands. In *T. texanum*, the styles are stouter and glands are nearly if not completely absent from the petals and stamens. The inflorescence of the latter species is very dense, with crowded stout pedicels and numerous flowers, while in *T. Paysonii*, the inflorescences are lax, with relatively few flowers and slender pedicels. This is shown in Fig. 1.

Thelypodium tenue Rollins, sp. nov.

Herbaceous annual; stems single from base, branched, glabrous and glaucous, over 3 dm. high; basal leaves pinnately lobed, petiolate, thickish, glabrous and glaucous, 1–2 dm. long, 2–4 cm. wide, more or less obtuse at apex, lobes irregularly dentate, broadly oblong, remote and narrower on lower part of leaf, decurrent on rachis, petioles striate, expanded at base; cauline leaves reduced upwards, nearly pectinate, glabrous, glaucous; inflorescence elongated, dense; pedicels very slender, divaricately ascending, glabrous, 2–3 cm. long; sepals greenish to slightly tinged with purple, non-saccate, oblong, 4–5 mm. long, ca. 1.5 mm. wide, spreading at anthesis; petals white, narrowly spatulate with a very narrow claw, 7–8 mm. long, 1.5–2 mm. wide, spreading at anthesis; stamens exserted, spreading at anthesis; filaments nearly equal, 7–8 mm. long, slightly dilated at base, subtended by a continuous mold of glandular tissue which is well developed beneath single filaments; anthers purplish, ca. 2.5 mm. long; young siliques erect, terete, glabrous, borne on a short stipe less than 1 mm. long; styles tapering toward apex, less than 1 mm. long; stigma circular, reduced, less in diameter than the end of the style.

Herba annua; caulibus crassis ramosis glabris et glaucis $>$ 3 dm. altis; foliis radicalibus crassis petiolatis pinnatilobatis glabris et glaucis 1–2 dm. longis, 2–4 cm. latis, lobis dentatis; foliis caulinis pinnatilobatis vel pectinatis; pedicellis tenuibus divaricato-ascendentibus glabris 2–3 cm. longis; sepalis oblongis nonsaccatis patentibus 4–5 mm. longis, ca. 1.5 mm. latis; petalis anguste spathulatis albis patentibus 7–8 mm. longis, 1.5–2 mm. latis; staminibus exsertis; siliquis immaturis stipitatis subteretibus; stylis tenuibus $<$ 1 mm. longis.

Type in the Gray Herbarium collected in the bed of Fresno Creek, about 1 mile below Smith Mine, Presidio Co., Texas, Jan. 25, 1942, *L. C. Hinckley 2336*.

Thelypodium tenue is the fourth species belonging to the group of which *T. Wrightii* was the only known member for many years. As previously indicated[1] *T. Wrightii* has been segregated as a genus distinct from *Thelypodium* and called *Stanleyella Wrightii*. However, I cannot find adequate grounds for making such a separation. The essential unity and inter-

[1] Contrib. Dudley Herb. 3: 371. 1946.

relationship of *T. Wrightii* with the rest of *Thelypodium* is further pointed up by the characteristics of *T. tenue*. The latter species is most nearly related to *T. texanum* and *T. Paysonii*, but it does have very slender pedicels similar in diameter to those of *T. Wrightii* but much longer and more ascending. *T. tenue* has much better developed glandular tissue than any of the other three species in this alliance and in that respect helps to tie the group into *Thelypodium* proper.

One point on which *T. tenue*, *T. Paysonii* and *T. texanum* differ from the widespread *T. Wrightii* is the shape of the style. In the latter, the style is club-shaped, whereas in the other three, the style narrows from its base to the stigmatic surface. However, all are alike in having an entire stigma that is not as great in diameter as the style. Also, all four species have spreading sepals and petals, exserted anthers and stipitate siliques.

The particularly distinctive feature of *T. tenue* is the very slender pedicels 2–3 cm. long. Actually, the lower flowers of the inflorescence are subtended by the uppermost cauline leaves, which is another distinctive characteristic.

Sisymbrium longipes Rollins, sp. nov.

Biennial or possibly perennial; stems stout, up to 6 mm. in diameter, single from an unbranched caudex, glabrous, branched above, rather leafy, 7.5–15 dm. high; basal leaves unknown; cauline leaves petiolate, glabrous, blade broadly ovate to nearly oblong, entire or obscurely dentate, cuneate at base, pinnately veined but only the central vein very evident, obtuse at apex, 2–4 cm. long, 1–3 cm. wide, petiole 1–2 cm. long, slender; inflorescence dense at apex but rather delicate, greatly elongated and with individual flowers becoming more widely spaced downward, lowermost separated by 4–5 cm.; sepals narrowly oblong, non-saccate, glabrous, pinkish, narrowed slightly toward base, 3–3.5 mm. long, ca. 1 mm. wide; petals spatulate, differentiated into blade and claw, claw very slender, rosy pink when dry, 3.5–4.5 mm. long, blade ca. 1.5 mm. wide; stamens tetradynamous but the single ones only about 1 mm. shorter than the paired, anthers about 1.5 mm. long; glandular tissue poorly developed into a thin but definite mold surrounding single stamens and subtending paired stamens; ovary topped by a very short (less than 0.5 mm.) style; pedicels of young siliques very slender, divaricately ascending, glabrous, 1–2 cm. long; young siliques straight, erect to somewhat spreading, apparently terete, up to 4 cm. long, less than 0.5 mm. wide; style about 1 mm. long; stigma unexpanded, not sufficiently lobed to tell whether the lobes are over the replum or not.

Herba biennis vel perennis; caulibus robustis erectis glabris 7.5–15 dm. altis superne ramosis; foliis radicalibus ignotis; foliis caulinis petiolatis glabris laminis late ovatis vel late oblongis integris obtusis 2–4 cm. longis, 1.3 cm. latis; petiolis tenuibus 1–2 cm. longis; inflorescentiis elongatis laxis; sepalis incarnatis nonsaccatis anguste oblongis glabris 3–3.5 mm. longis, ca. 1 mm. latis; petalis spathulatis incarnatis 3.5–4.5 mm. longis, ca. 1.5 mm. latis; pedicellis tenuibus divaricatis glabris 1–2 cm. longis; siliquis immaturis erectis vel divaricatis tenuibus 3–4 cm. longis, ca. 0.5 mm. latis; seminibus ignotis.

Type in the Gray Herbarium, collected above La Mina, Sierra Madre Mountains, near Monterrey, Nuevo León, Mexico, July 23, 1933, *C. H. & M. T. Mueller 548*. Isotype at Chicago Natural History Museum.

There is a real question as to whether this species and the next should be placed in *Sisymbrium*. Both species are related to *Sisymbrium linearifolium* (Gray) Payson, a species segregated from *Thelypodium* by Rydberg as *Hesperidanthus*. The latter genus was maintained by O. E. Schulz[2] as monotypic, including *H. linearifolius* alone. It was at one time placed in *Thelypodium* by Gray, but the species should not be retained there. In placing *S. longipes* in the genus *Sisymbrium*, I am following the treatment of Payson.[3]

The general appearance of *S. longipes*, as well as the technical characters of the flower and fruit, indicate that it should be associated with *S. linearifolium*. The buds of both species are rose to rose-pink and slightly enlarged near the middle. The flowers occur on slender pedicels that become very much elongated in fruit. This is especially true in *S. longipes*. Perhaps the most distinctive feature of the latter species is the very broad petiolate leaf. Because of its leaves, I have compared it with the Mexican species of *Iodanthus*, but it clearly does not fit in that genus. The leaves are grey-green to bluish grey and somewhat glaucescent, suggesting that the plants come from an arid area.

Sisymbrium retrofractum Rollins, sp. nov.

Annual or biennial; stem single from an unbranched base, branched above, glabrous, 5–8 dm. high; basal leaves not seen; cauline leaves petiolate, lanceolate to linear-lanceolate, glabrous, glaucous, 4–6 cm. long, 4–10 mm. wide, reduced upward, lower dentate to somewhat lobed, upper nearly entire, petiole ca. 1 cm. long; inflorescence lax; flowers

[2] Pflanzenf. 17b: 564. 1936.
[3] Univ. Wyo. Publ. 1: 19. 1922.

Fig. 2. *Sisymbrium retrofractum* Rollins. A—habit × 2/5. B—flower × 4. C—silique × 1-1/5. Drawings from the type by B. Tugendhat.

erect or on divaricate slender pedicels; sepals glabrous, purplish, oblong, 3.5–4 mm. long, ca. 1 mm. wide, outer pair somewhat saccate; petals spatulate with a pronounced slender claw, whitish, 6–8 mm. long; fruiting pedicels strictly reflexed, slender, glabrous, scarcely expanded at apex, 10–12 mm. long; siliques immature, narrowly linear, nearly terete, pendulous, glabrous, 4–6 cm. long, valves with single nerve almost full length; styles ca. 2 mm. long; stigmas scarcely expanded; seeds unknown. Fig. 2, A–C.

Herba annua vel biennis; caulibus erectis glabris inferne simplicibus superne ramosis, 5–8 dm. altis; foliis caulinis lanceolatis vel lineari-lanceolatis

petiolatis dentatis vel sinuato-dentatis glabris glaucis 4–6 cm. longis, 4–10 mm. latis; sepalis glabris purpureis oblongis 3.5–4 mm. longis, ca. 1 mm. latis; petalis spathulatis albidis 6–8 mm. longis pedicellis fructiferis retroflexis tenuibus glabris 10 12 mm. longis; siliquis immaturis anguste linearibus teretibus pendulis glabris 4–6 cm. longis; stylis ca. 2 mm. longis; seminibus ignotis.

Type in the Gray Herbarium collected on bare sandstone outcroppings covered with low brush and herbs, flowers purple and white, altitude 2850 meters, mountain 18 kilometers west of Conception del Oro, Coahuila, Mexico, July 22, 1941, *L. R. Stanford, K. L. Retherford and R. D. Northcraft 570.*

The most distinctive characteristic of *Sisymbrium retrofractum* is the reflexing of the siliques. In flower, the pedicels are erect or at least divaricately ascending, but as the silique matures, the pedicels bend sharply downward. In this respect the species is like some species of *Arabis*, such as *A. Holboellii*, where the pedicels are characteristically reflexed. But the resemblance in this regard is only superficial and should not be used as a basis for assuming that *S. retrofractum* is to be referred to *Arabis.*

As with *Sisymbrium longipes*, the closest relative is *S. linearifolium.* The flowers are quite similar to the latter species in *S. retrofractum* except for the fact that they are very much smaller. The siliques are very similar to those of *S. linearifolium* as to shape and the nature of the style, but the silique position is very much different. In *S. linearifolium*, the siliques are erect and the pedicels are divaricate, whereas in *S. retrofractum*, the siliques are pendulous and the pedicels are strictly reflexed.

Mancoa laxa Rollins, sp. nov.

Annual, stems highly branched from near base and above, sparsely pubescent with branched trichomes, 1–2 dm. long; basal leaves not present; cauline leaves few, sessile, pinnately lobed, with auricles at base, glabrous, 8–12 mm. long, 2–5 mm. wide, lobes oblong, entire or dentate, rounded at apex; inflorescence greatly elongated, lax, 1–1.5 dm. long, lower flowers bracteate; pedicels divaricately ascending, straight, sparsely pubescent, 3–4 mm. long; sepals oblong, glabrous, greenish, non-saccate, ca. 1.5 mm. long, < 1 mm. wide, broadly hyaline-margined; petals white, broadly spatulate, 3.5–4 mm. long, ca. 1.5 mm. wide; stamens tetradynamous, filaments somewhat flattened, ca. 2.5 mm. long, not dilated at base, subtended by distinct lobes of glandular tissue at base on each side, anthers purple, ca. 0.75 mm. long; siliques broadly

oblong, glabrous, sessile, rounded above and below, compressed contrary to the septum, 5–6 mm. long, 2.5–3 mm. wide, individual valves boat-shaped; styles slightly less than 1 mm. long, strongly expanded at apex; replum oblong, rounded below, acute at apex; seeds numerous, brown, wingless, plump, ca. 0.75 mm. long, ca. 0.5 mm. broad; cotyledons incumbent; funiculi free, slender, about the same length as the seeds, present the full length of the replum.

Herba annua; caulibus ramosis sparse pubescentibus 1–2 dm. altis; foliis radicalibus ignotis; foliis caulinis sessilibus glabris pinnatifidis auriculatis 8–12 mm. longis, 2–5 mm. latis; inflorescentiis laxis elongatis 1–1.5 dm. longis, ad basim bracteatis; pedicellis divaricatis rectis sparse pubescentibus 3–4 mm. longis; sepalis glabris oblongis nonsaccatis ca. 1.5 mm. longis, $<$ 1 mm. latis; petalis albis late spathulatis 3.5–4 mm. longis, ca. 1.5 mm. latis; siliquis 30–70-ovulatis late oblongis glabris sessilibus compressis 5–6 mm. longis, 2.5–3 mm. latis; stylis $<$ 1 mm. longis; seminibus exalatis oblongis noncompressis ca. 0.75 mm. longis; cotyledonibus incumbentibus.

Type in the U. S. National Herbarium, collected on wet loam of prairie, Rosario, east of La Junta, Chihuahua, Mexico, September 14–15, 1934, *Francis W. Pennell 18767.*

Three of the seven previously known species of *Mancoa*[4] occur in Mexico. Two of these, *M. bracteata* and *M. mexicana*, are evidently of limited distribution, but the third, *M. pubens*, is found more widely, extending from western Texas to Chihuahua and Coahuila. The other four species are South American. The presently described new species is most closely related to *M. bracteata.*

The chief points of difference between *M. bracteata* and *M. laxa* are as follows: (1) *M. bracteata* is strict in growth-habit, with the stems, leaves and infructescences rigidly erect; *M. laxa*, on the other hand, has a lax growth-habit with somewhat decumbent stems and indifferently ascending branches and infructescences; (2) the pedicels of the former species are numerous, densely congested, at right angles to the rachis and 6–8 mm. long, whereas the pedicels of *M. laxa* are fewer, not congested, divaricately ascending and 3–4 mm. long; (3) the leaves of *M. bracteata* are more numerous, larger, and more uniformly lobed than those of *M. laxa* and the sparse pubescence is considerably coarser. All of these items taken together show a rather sharp break in the possible continuity of characteristics that should be present if we were dealing with a single species rather than two species, as is indicated by the evidence.

[4] Contrib. Dudley Herb. **3**: 191–196. 1941.

Cibotarium microcarpum Rollins, sp. nov.

Perennial with a suffruticose base, caudex branched once or twice, remnants of old leaf-bases present; stems terete, branched above, densely pubescent with dendritically branched trichomes, 1.5–3 dm. high; leaves all similar, overlapping, reduced in size upward, petiolate, spatulate to oblanceolate, obtuse, shallowly dentate, somewhat sinuate, densely pubescent with dendritically branched trichomes, with a single prominent nerve below, 1–4 cm. long, 2–5 mm. wide; infructescences terminating the branches, ca. 1 dm. long; pedicels slender, straight, divaricately spreading at ca. 60° angle from rachis, 3–4 mm. long; sepals greenish with a hyaline margin, oblong, sparsely pubescent, spreading at anthesis, less than 1 mm. long, ca. 0.5 mm. wide; petals minute, white, narrowly spatulate, shorter than sepals, ca. 0.75 mm. long, ca. 0.1 mm. wide; stamens exserted, spreading filaments equal or nearly so, 1.25–1.5 mm. long; anthers purplish or yellowish, oval, ca. 0.1 mm. long; pollen oblong, $23.3 \times 12.6\ \mu$ (ave. 10 grains); siliques slightly oblong to nearly orbicular, not flattened, densely pubescent on the exterior, glabrous within, 1.5–2.5 mm. long, 1.25–1.5 mm. broad, stipitate; stipe ca. 0.2 mm. long; valves not nerved; styles slender, ca. 1 mm. long; seeds 4–6 in each loculus, oblong, wingless.

Herba perennis suffruticosa; caulibus teretibus ramosis pubescentibus 1.5–3 dm. altis; foliis petiolatis spathulatis vel oblanceolatis obtusis denticulatis dense pubescentibus infra 1-nervatis 1–4 cm. longis, 2–5 mm. latis; pedicellis tenuibus divaricatis rectis pubescentibus 3–4 mm. longis; sepalis oblongis nonsaccatis $<$ 1 mm. longis; petalis albis minutis anguste spathulatis ca. 0.75 mm. longis, ca. 0.1 mm. latis; siliculis stipitatis, oblongis vel globosis noncompressis pubescentibus 1.5–2.5 mm. longis, 1.25–1.5 mm. latis; stylis tenuibus ca. 1 mm. longis; seminibus oblongis immarginatis.

Type in the Gray Herbarium, collected on the dry rocky calcareous slopes of Barranca de Tolimán somewhat above the mines, 7.6 miles from Zimapán on road to Mina Loma del Toro and Balcones, District of Zimapán, Hidalgo, Mexico, October 30, 1949, *H. E. Moore, Jr. 5443*. Isotype at the Bailey Hortorium.

The siliques of this species are definitely stipitate although the stipe is very short. There is a slight tendency towards compression of the silique contrary to the septum but this is not at all marked. There is no suggestion of a notch at the apex. Instead, the valves tend to project toward the style to a minor degree. The siliques are nearest in size to those of *C. stellatum*, but they are neither notched nor compressed and the style is considerably longer than in that species. The petals, though very small, are not quite as abbreviated as in *C. stellatum*. In general aspect, *C. microcarpum* resembles *C. fruticulosum*,

but again, the fruits are neither compressed nor notched as in that species and the styles are considerably longer.

Cibotarium is one of the few genera in the *Cruciferae* where in some species an indument occurs on the interior of the siliques. No explanation of this rather remarkable phenomenon has been attempted, but a careful study of it might be rewarding for the light it would shed on the carpel situation in the crucifer fruit. So far, in this genus I have observed trichomes on the interior of the siliques of *C. divaricatum*, *C. macropetalum* and *C. macrum*.

The discovery of another new species of *Cibotarium* emphasizes the fact that the species of it are extremely local in their occurrence, often with only scattered individuals to be found. Furthermore, the need for much more exploration in the arid areas of northeastern and north central Mexico is clearly demonstrated.

Rorippa microtitis (Robins.) Rollins, comb. nov.

Sisymbrium microtites Robinson, Bot. Gaz. **30:** 59. 1900.

Nasturtium microtites (Robins.) O. E. Schulz, Rep. Spec. Nov. **34:** 134. 1933.

Mexico.—Chihuahua: 5 miles southeast of Colonia Garcia, Sierra Madre, 23 June 1897, *C. H. T. Townsend* and *C. M. Barber 43* (GH-type; F-isotype); shallow ditch, open pineland, Llanura de Babicora, Sierra Madre Occidental, 19 Sept. 1934, *F. W. Pennell 19019* (US); Majalca, 24 June 1936, *Harde Le Sueur 1210* (F, GH); same locality, 25 June 1936, *Le Sueur 640* (GH); Rio Chico, 5 Aug. 1937, *Le Sueur 1325* (GH).

With considerably more material than was available to Robinson, in all stages of development, it is perfectly evident, as it was to O. E. Schulz (l.c.), that this species is not a *Sisymbrium* but is to be associated with plants now placed in the genus *Rorippa*. Schulz had a somewhat different conception of *Nasturtium* than is generally held at present and this accounts for his having placed *Rorippa microtitis* in that genus.—GRAY HERBARIUM, HARVARD.

A New Tridens Record from Missouri.—The finding of *Tridens oklahomensis* (Feath.) Feath. in Missouri is the second reported occurrence of this species anywhere. Originally described from Oklahoma by Featherly,[1] *T. oklahomensis* was found in September, 1955 near Columbia, Missouri, T 48N, R 13W, sect. 3. Plants occurred in moist soil, with *T. strictus* and *T. flavus.* In general appearance *Tridens oklahomensis* resembles the latter; however, the panicles are more compact with the branches being floriferous for a greater proportion of their total length. The spikelets, which disarticulate early in *T. flavus,* remain intact through the winter on *T. oklahomensis,* thus exhibiting a feature typical of *T. strictus.* This new grass species has since been found in two more widely separated stations in which the two other *Tridens* also occurred. The pattern of distribution may be significant, and together with intermediate panicle characters found in *T. oklahomensis* suggests the possibility of a hybrid origin. Information concerning the Oklahoma species supplied by Dr. Featherly does not exclude this possibility. Furthermore, no location in Missouri has been found to date having two species present without the third. The examination of a great number of spikelets indicates that *T. oklahomensis* in Missouri is probably sterile. Additional study is needed to better interpret the distributional relationship of the three species, and perhaps determine the origin of *T. oklahomensis.* Appreciation is expressed for verifying the identity of Missouri material by Dr. Swallen. The author wishes to thank Dr. Featherly for his personal communications and for the loan of Oklahoma material. Deposits of Missouri specimens have been made in the University of Missouri herbarium. Specimens have also been sent to the National Herbarium.—C. L. Kucera, department of botany, university of missouri.

[1] Featherly, H. I. A New Triodia from Oklahoma. Rhodora **40**: 1938.

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THE NEW ENGLAND BOTANICAL CLUB

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A REVISION OF THE GENUS ASCYRUM (HYPERICACEAE)[1]

WILLIAM P. ADAMS

THE genus *Ascyrum*, a member of the *Hypericaceae* (*Guttiferae* of some authors), has not been studied monographically since Coulter's treatment for the Synoptical Flora of North America (1897). Several regional interpretations of the genus have been published during the past fifty years but none of them is adequate for the entire range of the genus.

The present study is based upon approximately 3800 specimens which were kindly lent by the curators of the following herbaria. The herbarium abbreviations used are those recommended by Lanjouw and Stafleu (1956).

CINC, University of Cincinnati; CLEMS, Clemson Agricultural College; DUKE, Duke University; F, Chicago Natural History Museum; FLAS, Florida Agricultural Experiment Station; GA, University of Georgia; GEO, Emory University; GH, Gray Herbarium; IND, Indiana University; K, Royal Botanic Garden, Kew; LSU, Louisiana State University; MICH, University of Michigan; MISSA, Mississippi State College; MO, Missouri Botanical Garden; NCSC, North Carolina State College; NCU, University of North Carolina; NO, Tulane University; NY, New York Botanical Garden; OKL, University of Oklahoma; OS, Ohio State University; PENN, University of Pennsylvania; PH, Academy of Natural Sciences; SMU, Southern Methodist University; TENN, University of Tennessee; TEX, University of Texas; US, United States National Herbarium; VDB, Vanderbilt University; WVA, West Virginia University; also the University of Louisville, Ky., and University of South Carolina.

Only a limited number of representative specimens are cited for most of the taxa involved. A complete list of all specimens

[1] Condensed and revised from a thesis submitted in partial fulfillment of the requirements for the degree of Master of Science at the University of Georgia, June 1956.

examined in this study may be found in the original thesis at the Library of the University of Georgia.

ACKNOWLEDGEMENTS

I wish to express my appreciation to Dr. Wilbur H. Duncan (University of Georgia) for his advice and assistance while directing this study. The critical examination of the manuscript by Dr. R. B. Channell (Gray Herbarium) has been invaluable. The suggestions of Dr. Jonathan J. Westfall and Mr. S. Alton Ewing (University of Georgia), Dr. Robert L. Wilbur (North Carolina State College), and Mr. Robert L. Dressler (Gray Herbarium) are gratefully appreciated.

HISTORICAL ACCOUNT

Plants of the genus *Ascyrum* were perhaps first described by Plumier (1703) in his genus *Hypericoides*. In the "Genera Plantarum" (1737) Linnaeus established the genus *Ascyrum* for these plants. Although Linnaeus (1753) described three species it is most probable that his concepts of the genus were based entirely upon citations from other authors rather than on actual herbarium material. Torrey and Gray (1840) were the first to suggest that Linnaeus had no specimens of the genus prior to 1758. Both Jackson (1912) and Savage (1945) concur in the same belief from their studies of the Linnaean herbarium. As a result, considerable nomenclatural confusion is evident in the treatments of Linnaeus which persisted until Fernald's discussion of the *A. hypericoides* complex in 1936.

The first comprehensive monographic treatment of *Ascyrum* appeared in Choisy's study of the *Hypericaceae* (1821). Six species and one variety were recognized. Sixteen years later, a more extensive but less discerning study of the genus was published by Spach (1836). This treatment, illustrating an extreme of taxonomic interpretation, was based upon insufficient material and lacked field study. It is significant that the American taxonomists Coulter (1886, 1897), Chapman (1897), and Mohr (1901), who possessed field experience with the genus, did not follow Spach's interpretation. The next monographic treatment of *Ascyrum* was by Coulter in 1886. His study followed closely the concepts of Torrey and Gray (1840).

Geographical Distribution

The genus *Ascyrum*, as circumscribed in this study, is restricted to North America. Although the Himalayan *A. filicaule* Dyer, the type (K) of which I have examined, possesses certain characters traditionally assigned to this genus, I cannot include it within *Ascyrum* sensu stricto. Like American Ascyrums, this species has a tetramerous calyx and corolla, the sepals in two unequal pairs, but its herbaceous habit precludes its being considered as congeneric with the American taxa. No change in its status seems desirable at this time, however, inasmuch as a thorough study of the related genus *Hypericum* should be made before any such alteration can be justified.

The six taxa of *Ascyrum* are found primarily in southeastern United States and three species occur only in the extreme southeastern part of the area. Two other taxa range south of the glacial boundary from New Jersey to eastern Texas. Another species may be found over most of this area, but also occurs in the West Indies and along the Eastern Escarpment in Central America as far south as Honduras.

Distinctiveness of the Genus

Whether or not *Ascyrum* should be recognized as generically distinct from *Hypericum* is in question. The basis for the recognition of *Ascyrum* is the cruciate tetramerous calyx and corolla, with the sepals of two unequal pairs. *Hypericum* has traditionally been separated on the basis of pentamerous petals and sepals, the outer more or less equal. Yet, various authors have suggested that the two taxa may not actually be distinct. Coulter (1897) stated: "The propriety of a generic separation from *Hypericum* is very doubtful." Essentially the same view was held by Keller (1925) who pointed out that "reversions" to the pentamerous condition occasionally occurs in individual flowers of certain species of *Ascyrum*. Field observations made during the course of the present study indicate that pentamerous corollas are to be found occasionally in all species of *Ascyrum*, one of the petals usually being considerably reduced in size. The comparative study of stem anatomy by Vestal (1937) indicates that *Ascyrum* species differ very little from the woody members of the genus *Hypericum*.

Crookea microsepala (T. & G.) Small, geographically restricted to the vicinity of Tallahassee, Florida, where both *Ascyrum* and *Hypericum* species are abundant, serves as a "connecting link" and further obscures the distinction between the two genera. This species possesses the typically tetramerous corolla and calyx of *Ascyrum*, but has the sepals in two nearly equal pairs. Vegetatively, *Crookea* exhibits a general hypericum-like aspect and frequently the pentamerous floral condition of *Hypericum*. Tetramerous and pentamerous flowers may occur in this species on the same individual plant.

The occurrence of inequilateral sepals in certain species of *Hypericum* further suggests that that genus may not be generically distinct from *Ascyrum*. *Hypericum Bissellii* Robinson from Southington, Connecticut, and *H. macrosepalum* Rehder from western Szechuan, China, both have two sepals which are considerably larger than the other three. These species, however, both known from limited material only, may represent teratological forms.

Despite all of the evidence presented above, it seems best to maintain *Ascyrum* as a genus until such time as the closely related *Crookea* and *Hypericum* can be studied and the generic limits within the family clarified.

These three genera may be distinguished by the following key:

Sepals typically four, in more or less unequal pairs, the outer pair usually much larger than the inner; petals mostly four.
  Outer pair of sepals very much larger than the inner........*Ascyrum*.
  Outer and inner pairs of sepals nearly equal in size..........*Crookea*.
Sepals five, typically approximately equal; petals mostly five..*Hypericum*.

Systematic Treatment

Ascyrum L. Gen. Pl. 231. 1737; Sp. Pl. **1:** 787. 1753.

Hypericoides Adanson, Fam. Pl. **2:** 443. 1763.

Low, evergreen shrubs. Stems simple, sparsely branched or dichotomously branched above, younger stems two-edged or winged. Root system usually of one main taproot with several fibrous laterals. Leaves simple, opposite, exstipulate, entire, firm or coriaceous, merely sessile to closely clasping, superficially punctate with numerous translucent internal glands, venation pinnate, the lateral veins typically obscure. Flowers perfect, actinomorphic, pedicellate, each subtended by 2 bract-

lets, solitary or in small cymules, terminal or from the upper axils. Sepals 4, herbaceous, in 2 pairs, the outer appressed to each other in bud, usually persistent beyond shedding of the seeds, the inner much smaller and narrower, or obsolete. Petals 4, rarely 5, yellow, hypogynous on the short receptacle, oblique, fugacious, cruciate, widely spreading, convolute in the bud. Stamens numerous, distinct, or weakly connate by their filaments at the base, scarcely clustered, marcescent. Anthers round-ovate, versatile, dehiscing laterally by longitudinal slits. Ovary unilocular, of 2–3, rarely 4 carpels, with 2–4 parietal placentae bearing numerous ovules. Styles 2–4, distinct or somewhat united below. Capsule ovate, dehiscence septicidal, enclosed by the persistent sepals. Seeds numerous, black, reticulate.—Type species: *Ascyrum hypericoides* L.

Key to the Species of Ascyrum

A. Styles 2; inner sepals minute or obsolete.
- B. Pedicels reflexed at maturity; subtending bractlets at the *base* of the pedicel, remote from the sepals..........1. *A. pumilum.*
- B. Pedicels erect, even at maturity; subtending bractlets near the *apex* of the pedicel, approximate the sepals....2. *A. hypericoides.*

A. Styles 3–4; inner sepals only slightly smaller than the outer which are 9–20 mm. long, 6–18 mm. wide.
- C. Sepals and leaves distinctly unlike in shape; leaves merely sessile.
  - D. Outer sepals prominently veined, the 6–7 lateral veins conspicuous, broadly ovate or suborbicular, obtuse or acute; plants without adventitious shoots; the stem simple or sparsely branched..............3. *A. stans.*
  - D. Outer sepals obscurely veined, the lateral veins inconspicuous, cordate, acuminate; plants with adventitious shoots from horizontal roots; the stems usually dichotomously branched............4. *A. edisonianum.*
- C. Sepals and leaves similar in shape; leaves strongly clasping.................................5. *A. tetrapetalum.*

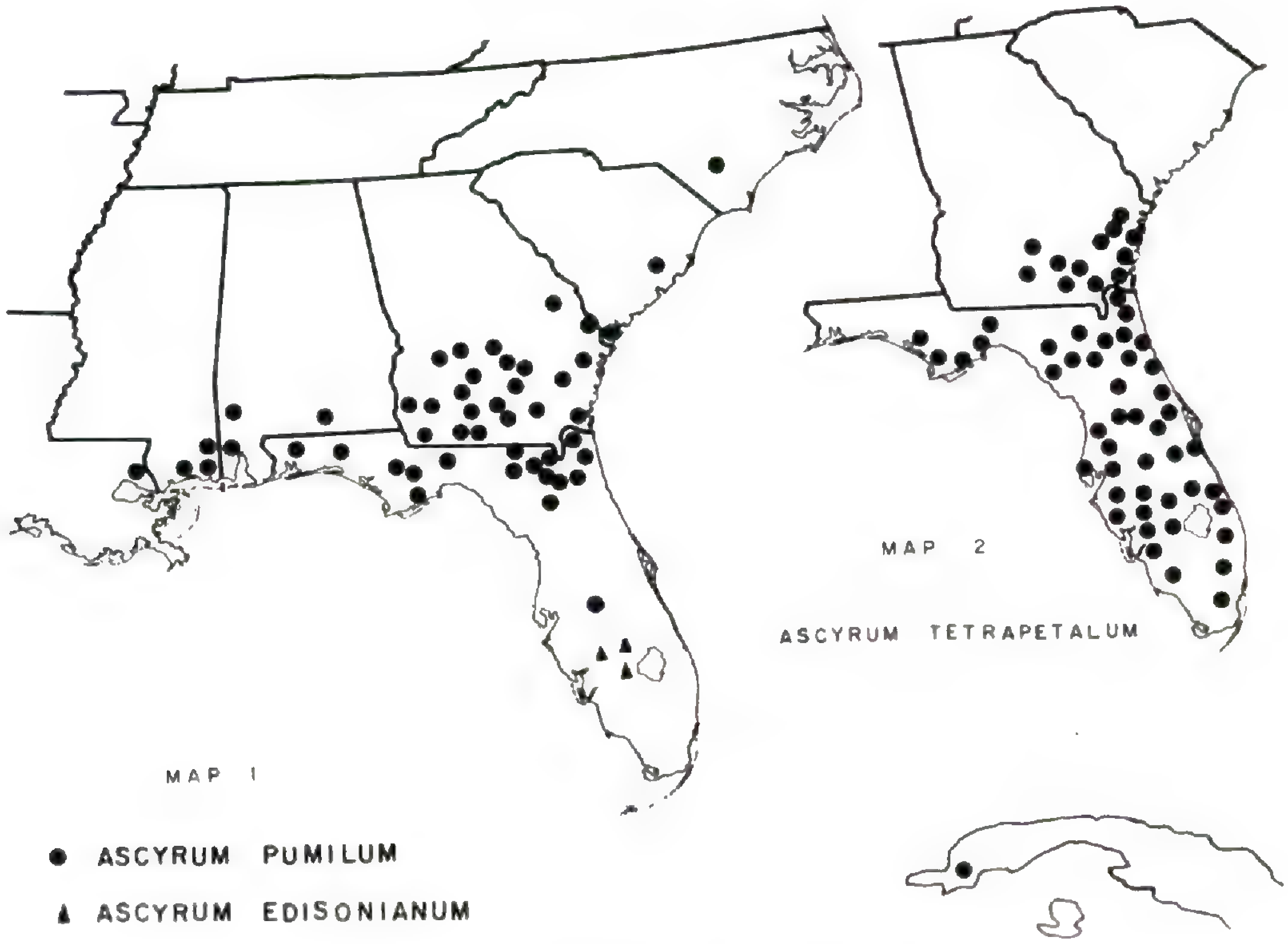
1. **Ascyrum pumilum** Michx. Fl. Bor.-Am. **2:** 77. 1803.

A. pauciflorum Nutt. Gen. **2:** 15. 1818.

Diminutive shrub, 6–15(–20) cm. high, with spreading branches. Leaves linear-oblong to oval, sometimes narrowly obovate, (3–)4–8(–10) mm. long, 1–3 mm. wide, ascending to somewhat spreading, midvein slightly elevated beneath, venation otherwise obscure. Pedicels (5–) 7–10(–12) mm. long, reflexed at maturity, the bractlets basal. Outer sepals oval to ovate, (4–)5–7(–8) mm. long, (4–)4.5–6(–8) mm. wide, obtuse to acute, very similar to the leaves in color and texture, Inner sepals minute or obsolete. Petals often unequal, obovate, (4–)5–6(–8) mm. long, 1.5–4(–5) mm. wide. Styles 2, more or less united. Flowering during spring and early summer. Type locality: "Hab. in Georgia." Type: presumably in the Michaux Herbarium, Muséum d'Histoire Naturelle de Paris, not seen.

DISTRIBUTION: Dry, sandy, open pinelands of the Coastal Plain in Bladen County, North Carolina, Berkeley County, South Carolina, southern Georgia, northern and western Florida, lower Alabama, southeastern Mississippi, and St. Tammany Parish, Louisiana. MAP 1.

This is a relatively poorly collected species, probably due to the small size of the plants, their low, inconspicuous habit, and the fugacious nature of the petals which usually fall by midday. The species is known from only three stations in the



Carolinas. Additional collections are needed, therefore, to determine the northern limit of its range. The elongated pedicels which are more or less reflexed at maturity, the sepals which are wider than the leaves, and the rather small size of the plants serve to distinguish this species. Morphologically, it is quite uniform throughout its range, probably the least variable species of the genus.

REPRESENTATIVE SPECIMENS.—**Alabama.** Covington Co.: *Hardin & Duncan 14974* (GA). **Florida.** Baker Co.: *West & Arnold* 25 April 1940 (FLAS). Columbia Co.: *Nash 2211* (GH, MICH, MO, NY, US). Duval Co.: *Curtiss 246* (F, FLAS, GH, MISSA, MO, NY, PH, US). **Georgia.** Camden Co.: *Moldenke 1180* (DUKE, MO, NY, PENN). Dodge Co.: *Duncan 5035* (GA). Effingham Co.: *Leeds & Harper 2671* (PH). Thomas Co.;

Adams 30 (GA). **Louisiana.** St. Tammany Parish: *Bougere 2006* (LSU). **Mississippi.** Harrison Co.: *Tracy 4489* (F, MICH, MO, NY, OS, US). Jackson Co.: *Donald* May 1930 (MISSA). **North Carolina.** Bladen Co.: *Wood 8499* (GH).

2. **Ascyrum hypericoides** L. Sp. Pl. 788. 1753, as to Plumier's plant, *Hypericoides frutescens erecta, floreo luteo.*

Shrubs, erect or ascending, (3–)5–12(–15) dm. tall, or decumbent and somewhat diffuse, (8-)10–20(–30) cm. tall, simple or sparsely branched below, or with numerous slender stems arising from the base, with or without long axillary branchlets, stems in age reddish-brown, with bark exfoliating in shreds. Leaves sessile, linear to oblanceolate, (5–)7–25 (–34) mm. long, (1–)1.5–6(–8.5) mm. wide, narrowed to the base, the apex obtuse or rounded, the margins slightly revolute, midvein slightly elevated at base, venation otherwise obscure. Pedicels 3–6 mm. long, with small bractlets borne near the apex. Outer sepals highly variable in shape and size, (5–)6–11(–12.5) mm. long, (2–)3–12(–13) mm. wide, broadly ovate, cordate, often subcordate at base, ovate-elliptic to elliptic, obtuse to acute, obscurely 3–5-veined. Inner sepals minute or obsolete. Petals narrowly oblong-elliptic, (7–)8–11(–12) mm. long, 2–4(–5) mm. wide. Styles 2. Capsule included or exserted at maturity. Flowering during summer and early fall, or throughout the year in the more southern parts of the range.

This species is quite variable as to the size and shape of the leaves and sepals, characters previously considered important in the segregation of varieties. This variability, in addition to the fact that Linnaeus' concepts concerning *Ascyrum* (1753) were derived apparently from the writings of other authors, has resulted in considerable nomenclatural and taxonomic confusion. As already indicated, it is possible that Linnaeus did not have specimens of the genus at hand in 1753. At that time *Ascyrum* consisted of three species. Of these, *A. Crux-Andreae* has been shown to be *Hypericum mutilum* by Torrey and Gray (1840). From the second edition of Species Plantarum (1763) it may be noted that Linnaeus' concept of *A. Crux-Andreae* changed. Torrey and Gray, as well as later authors, have used the name in this altered Linnaean sense, but, as Fernald (1936) pointed out, ". . . such a procedure is no longer justified, since *A. Crux-Andreae* of ed. 1 [Sp. Pl.] was merely *Hypericum mutilum*." Another species, *A. hypericoides*, in the 1753 treatment of Linnaeus was a mixture, as Torrey and Gray (1840) and Fernald (1936) have shown. Of the four references to previous authors which Linnaeus gave for this species, only the Plumier citation can be considered as applicable.

This extremely polymorphic species has been variously interpreted by post-Linnaean students of the genus. Spach (1836) recognized five separate species in this complex, but, as pointed out above, his treatment reflects a lack of field study and was based upon insufficient herbarium material. It is to be noted that four of Spach's segregates of *A. hypericoides* were promptly reduced to synonymy by Torrey and Gray (1840). In 1886 Coulter interpreted this complex as comprising two species, but, eleven years later (1897), he united these taxa, commenting that ". . . the attempt to maintain two distinct species seems untenable." A more satisfactory interpretation of *A. hypericoides* was presented by Fernald (1936), who recognized three varieties. The complex was considered to be composed of a single species by Gleason (1952) whose treatment, judging from the nature of the format, obviously de-emphasized Fernald's three varieties.

The results of the present study of the genus indicate that *A. hypericoides* is best considered as a single wide-ranging, extremely polymorphic species of two well-defined varieties. One of these, var. *multicaule*, is a many-stemmed plant of decumbent form, with a generally more northern distribution. The highly variable assemblage of erect forms, of more southern distribution, comprise var. *hypericoides*. This interpretation is based upon the analysis of several hundred herbarium specimens and extensive field observations.

The conspicuous differences in growth habit serve to distinguish the two varieties of this species. Individual plants of *A. hypericoides* var. *multicaule* have several stems which arise from the primary rootstock near ground level and lie more or less prostrate upon the ground. Each of these decumbent stems bears numerous erect branches, so as to form a low, diffuse mat which may reach 3 to 4 dm. in diameter. By contrast, var. *hypericoides* has an erect habit of growth and may attain a height of 1 meter. Typically with only one main stem, these plants usually branch repeatedly well above ground level. If the primary stem has been injured mechanically or by fire, however, a different habit of growth may be produced. Such plants, generally regarded as "stump sprouts", are characterized by numerous erect branches which arise from the base of the

plant near ground level, but they do not exhibit the decumbent habit of var. *multicaule.*

It has been suggested that the differences between the varieties of *A. hypericoides* recognized by Fernald may be due to environmental conditions (Gleason, 1952). Two of these varieties are probably influenced considerably by habitat factors, but it is very doubtful that the distinctive growth form of var. *multicaule* is the result of such environmental modification. Numerous instances are known in which both the decumbent var. *multicaule* and the erect var. *hypericoides* grow immediately adjacent or only a few feet from one another. It seems obvious that such gross differences in growth habit cannot be attributed solely to extrinsic factors.

While there is some presumptive evidence which suggests that the *A. hypericoides* complex might be composed of two distinct species, no constant floral differences are known which substantiate such a separation. Both Coulter (1897) and Fernald (1936) were unsuccessful in their search for floral characters upon which to elevate these varieties to specific status. Similar negative results have been obtained in the present study. Even though both varieties have been observed in close proximity, no intergradation in growth habit has been detected.

Key to the Varieties of A. hypericoides

A. Plants erect in habit, usually with a single main stem 3–8 dm. tall, freely branched well above the ground level; leaves extremely variable in size and shape, usually linear-elliptic to linear-oblong, broadest near the middle. . . . . 2a. *A. hypericoides* var. *hypericoides.*

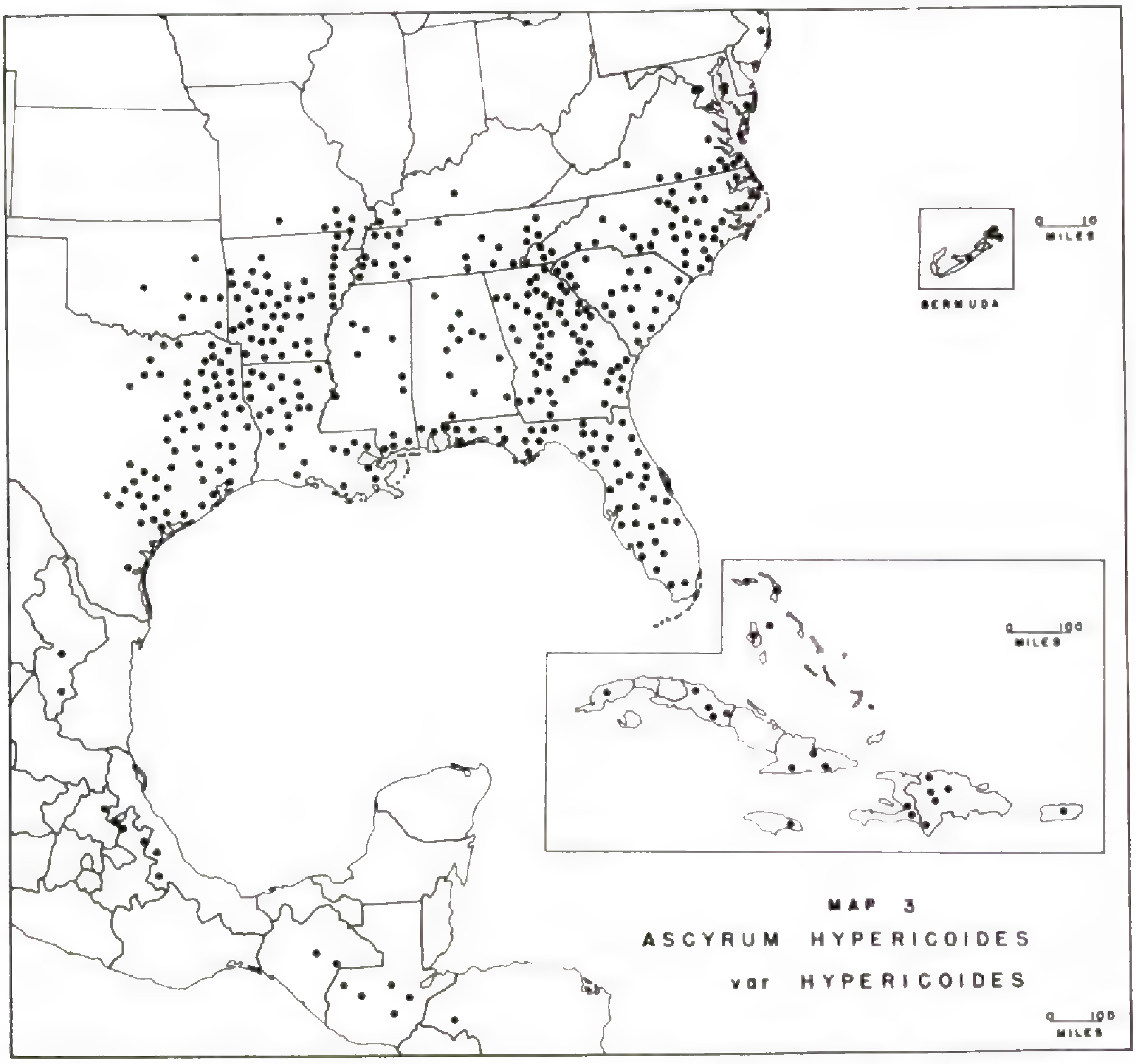
A. Plants decumbent in habit, with several prostrate stems arising from the primary rootstock near ground level, each with numerous erect branches 1–2(–3) dm. tall, forming low, compact mats 3–4 dm. in diameter; leaves generally uniform in size and shape, usually oblanceolate, broadest above the middle. . . . . 2b. *A. hypericoides* var. *multicaule.*

2a. **Ascyrum hypericoides** L. var. **hypericoides.**

Ascyrum Hypericoides L. Sp. Pl. 2: 788. 1753, as to Plumier's plant; ed. 2, 2: 1108. 1763, excl. Plukenet reference (fide T. & G. Fl. N. Am. **1:** 671. 1840). *A. Crux-Andreae β angustifolium* Nutt. Gen. **2:** 16. 1818. *A. linifolium* Spach, Hist. Nat. Vég. **5:** 459. 1836. *A. oblongifolium* Spach, Hist. Nat. Vég. **5:** 461. 1836. *A. montanum* Raf. Sylva

Tellur. 16. 1838. *A. Plumieri* Bertol. in Mem. Acc. Sci. Bolog. **4:** 77. 1853. *A. macrosepalum* S. Brown in Britton, Jour. N. Y. Bot. Gard. 13: 192. 1912. *A. Hypericoides* L. var. *typicum* Fernald, Rhodora **38:** 432. 1936. *A. Hypericoides* L. var. *oblongifolium* (Spach) Fernald, Rhodora **38:** 433. 1936. Type locality: "Hab. in Jamaica." Neotype: specimen number 944.2 in the Linnaean Herbarium (GH, photograph examined).

Distribution: Dry, open, sandy woods to moist, shady, rich woods and thickets from southern Virginia, westward into southern Missouri



and southeastern Oklahoma, southward into Texas and Florida; also in Bermuda, Bahama Islands, Cuba, Haiti, Dominican Republic, Puerto Rico, Jamaica, the Eastern Escarpment of Mexico, and the highlands of Guatemala and Honduras. MAP 3.

The designation of a neotype is necessitated by the following facts. First, Linnaeus most probably based his concept of *A. hypericoides* (1753) solely upon citations from other authors, having no actual specimens at hand. As shown previously,

the Linnaean reference to Plumier's plant is the only one which is applicable, the remaining references applying to other taxa. The description and figure of this plant (Plumier, 1703), however, are so vague and indefinite that they could easily represent other species of the genus which precludes the use of Plumier's plant as type. Secondly, it is very likely that the first specimen of *A. hypericoides* which Linnaeus actually examined was one of Patrick Browne's plants from Jamaica, which, according to Savage (1945), was probably not added to the Linnaean Herbarium until 1758. The alteration by Linnaeus of his concept of *A. hypericoides* in 1763 by the addition of a reference to Browne's Jamaican plant would appear to substantiate this interpretation. According to Savage (1945), the words "Ascyrum" and "Br" (Patrick Browne) appear on specimen number 944.2 in Linnaeus' handwriting. Savage pointed out further that most of Browne's specimens were bought by Linnaeus in 1758, which, if true, indicates that this specimen was available to Linnaeus in the preparation of the second edition of Species Plantarum (1763). It is concluded, therefore, that the best interest of nomenclatural stabilization is served by designating specimen number 944.2 of the Linnaean Herbarium as a neotype.

Ascyrum hypericoides var. *hypericoides* is quite polymorphic, being composed of a highly variable assemblage of erect plants. The complex was interpreted as two "geographic varieties" by Fernald (1936, 1950), but the characters employed as diagnostic are inadequate when material from throughout the range is considered. The shape and size of the leaves and sepals are the major characters used by Fernald. From the present study it is evident that a continuous type of variation exists, in which the plants exhibit subtle changes in quantitative characters. No correlation was found to exist between these characters and geographical distribution. The nature of the variation encountered in these characters is illustrated in Figures 1–25. These figures are arranged to emphasize the continuous change in leaf shape from one extreme ("linear-oblanceolate or linear-oblong") to the other ("oblong-oblanceolate"). Sepal shape varies in the same manner. A similar continuous variation is to be found in the size of both sepals and leaves (cf. Table 1).

Table 1. Quantitative analysis of the leaf and sepal variation in *Ascyrum hypericoides* var. *hypericoides* taken randomly from specimens throughout the range. Twelve measurements were made of each specimen of the sample: 3 each for length and width of leaves and sepals.

Leaves				*Sepals*			
Length		*Width*		*Length*		*Width*	
Size class mm.	*No. measurements*	*Size class mm.*	*No. measurements*	*Size class mm.*	*No. measurements*	*Size class mm.*	*No. measurements*
5	1	1.0	23	5.0	10	2.0	2
6	19	1.5	59	5.5	8	2.5	3
7	37	2.0	144	6.0	41	3.0	23
8	58	2.5	111	6.5	32	3.5	24
9	65	3.0	134	7.0	103	4.0	67
10	47	3.5	86	7.5	83	4.5	91
11	63	4.0	176	8.0	140	5.0	168
12	78	4.5	84	8.5	100	5.5	131
13	68	5.0	111	9.0	212	6.0	236
14	60	5.5	35	9.5	62	6.5	131
15	61	6.0	60	10.0	58	7.0	134
16	66	6.5	11	10.5	32	7.5	40
17	49	7.0	13	11.0	66	8.0	25
18	71	7.5	10	11.5	15	8.5	10
19	40	8.0	3	12.0	23	9.0	5
20	49	8.5	1	12.5	4	9.5	1
21	55			13.0	1		
22	42						
23	35						
24	24						
25	22						
26	18						
27	7						
28	18						
29	5						
30	2						
31	1						
32	2						
33	1						
34	1						

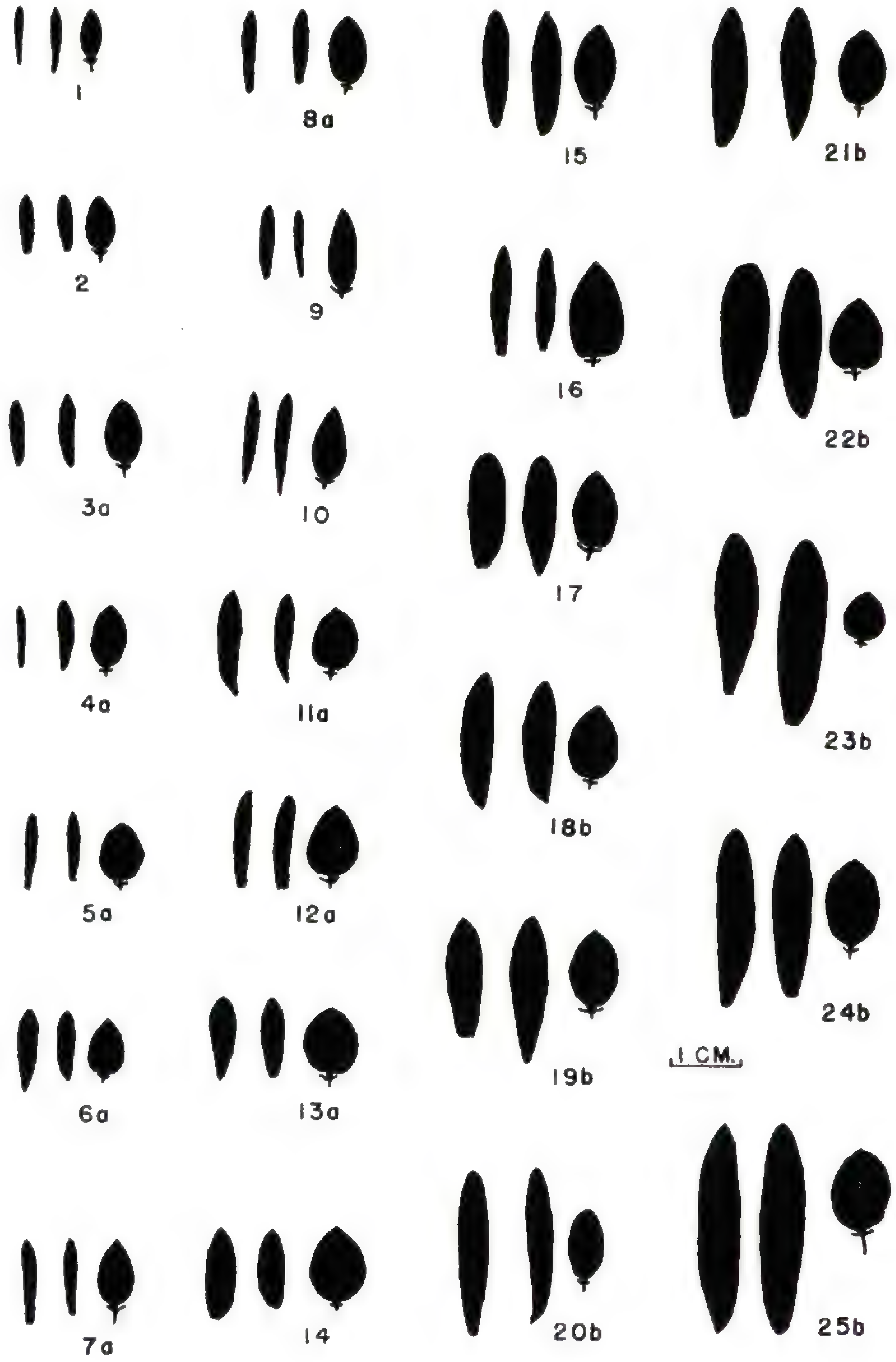
As suggested previously, *Ascyrum hypericoides* var. *hypericoides* is apparently influenced considerably by its environment. Such a belief is supported by numerous field observations made during the course of the present study as well as by data from herbarium specimens. Plants of var. *hypericoides*, for example, have been observed growing in fertile soils along shaded stream

banks and in thickets, while other plants of this variety were found on the dry, barren soils of sunny hillsides nearby. As would be expected, the plants in the shaded fertile habitats (cf. Fig. 19b, 20b, 21b) exhibit almost invariably much larger leaves and sepals than those of the adjacent hillsides (cf. Fig. 7a, 8a, 11a).

Several morphological tendencies exist within the wide-ranging *Ascyrum hypericoides* var. *hypericoides* which show some degree of geographical segregation. One of the most distinctive, that of the Bahama Islands and certain areas of Dade County, Florida, exhibits very slender twigs with a dense covering of narrowly linear leaves (Fig. 1). Although these plants do present quite a different general aspect, the segment of variation they represent is not considered worthy of taxonomic recognition. It is believed that the distinctive habit of growth of these plants is due primarily to the edaphic conditions (i.e., calcareous soils) under which they grow. Moreover, this variety exhibits a similar habit of growth in the xerophytic sandhill areas of the Carolinas and Georgia. Some of the herbarium specimens of var. *hypericoides* from Guatemala and Honduras have sepals which are rather elongate-elliptical and more or less long-acuminate (cf. Figures 9 and 10). These specimens are interpreted as representing still another variation tendency in this polymorphic variety.

The extension of the range of *Ascyrum hypericoides* var. *hypericoides* southward into Honduras is reported for the first time. This variety was collected in the vicinity of La Esperanza and Intibuca, Honduras, by Dr. Paul C. Standley in 1950.

REPRESENTATIVE SPECIMENS.—**Alabama.** Baldwin Co.: *Corbin 165* (SMU). **Arkansas.** Logan Co.: *Demaree 17697* (F, GH, MO, OKL). **Florida.** Dade Co.: *Hunnewell 5780; Small & Carter 2614* (FLAS, GH, NY, SMU), similar to the Bahaman material. **Georgia.** Oglethorpe Co.: *Cronquist 4588* (FLAS, GA, GH, MO, NO, SMU, US). **Kentucky.** Hickman Co.: *McFarland 213* (GH, MO). **Louisiana.** Caddo Parish: *Shinners 21177* (GA, SMU). **Maryland.** Worcester Co.: *Fernald, Long & Fogg 5573* (GH, PENN). **Mississippi.** Jackson Co.: *Seymour 91914* (DUKE, F, GH, MO, NCU, SMU, TEX). **Missouri.** Butler Co.: *Bush 3762* (GH, MO, US). **North Carolina.** Durham Co.: *Godfrey 6711* (GH, NCSC); Nash Co.: *Godfrey & Kerr 6628* (DUKE, GH, NCSC, the last two specimens are "stump sprouts"). **Oklahoma.** Atoka Co.: *Hopkins 2850* (OKL). **South Carolina.** Berkeley Co.: *Godfrey & Tryon 8217* (DUKE, F, GH, MO, NY, PENN, TENN,


1
8a
15
21b
2
9
16
22b
3a
10
17
4a
11a
23b
18b
5a
12a
24b
6a
13a
19b
1 CM.
7a
14
20b
25b

US); Lexington Co.: *Godfrey & Tryon 1301* (DUKE, F, GH, MO, NY, PENN, TENN, US—a "stump sprout"). **Tennessee.** Coffee Co.: *Norris & Sharp 16269* (TENN). **Texas.** Anderson Co.: *Barkeley 13598* (F, GH, MO, NY, OKL, SMU, TEX). **Virginia.** Southampton Co.: *Fernald & Long 7528* (GH, NY, PENN, US). **Bahama Islands.** New Providence: *Britton & Brace 842* (F, NY, US). **Bermuda.** *Brown, Britton & Seaver 1136* type collection of *Ascyrum macrosepalum* S. Brown (F, GH, MO, NY-*Type*, PH, US). **Cuba.** Oriente: *Shafer 8940* (GH, US). **Dominican Republic.** Santiago: *Valeur 754* (F, MICH, MO, NY, US). **Haiti.** *Holdridge 878* (MO, NY, US). **Jamaica.** *Orcutt 2669* (F, GH, MO). **Puerto Rico.** *Sintensis 6143* (F, GH, NY, PH, US). **Guatemala.** *Turckheim 88* (GH, NY, PH, US). **Honduras.** *Standley 25344* (F, US). **Mexico.** Chiapas: *Purpus 9091* (F, GH, MO, NY, US).

2b. **Ascyrum hypericoides** L. var. **multicaule** (Michx.) Fernald

Ascyrum Hypericoides L. var. *multicaule* (Michx.) Fernald, RHODORA **38:** 433. 1936. *A. multicaule* Michx. Fl. Bor.-Am. **2:** 77. 1803. *A. helianthemifolium* Spach, Hist. Nat. Vég. **5:** 460. 1836. *A. spathulatum* Spach, Hist. Nat. Vég. **5:** 462. 1836. Type locality: "Hab. in Va., Carolina." Type: in Michaux Herbarium, Muséum d'Histoire Naturelle de Paris (GH, photograph examined). Only the fragment on the extreme right edge of the type sheet can be considered as *A. hypericoides* var. *multicaule.* The other fragments to the left are *A. hypericoides* var. *hypericoides.* Distribution: Dry, sandy or rocky slopes, roadbanks, and occasionally shady, moist, rich woods, from Nantucket Island, Massachusetts, southward on the Coastal Plain into southeastern Virginia, on the Piedmont of North Carolina, westward into northeastern Texas, eastern Oklahoma, extreme southeastern Kansas, southern Missouri, northward to the glacial boundary in southern Illinois, Indiana, and Ohio, West Virginia and extreme southeastern Pennsylvania. MAP 5.

REPRESENTATIVE SPECIMENS.—**Alabama.** DeKalb Co.: *Ruth 381* (US). **Arkansas.** Carroll Co.: *Palmer 4400* (GH, MO, US). **Delaware.** Sussex Co.: *Long & Bartram 1572* (PH). **Georgia.** Hall Co.: *Duncan & Adams 19437* (GA). **Illinois.** Pope Co.: *Palmer 16698* (GH, MO, NY, PH). **Indiana.** Clark Co.: *Deam 5414* (IND, NY). **Kansas.** Cherokee Co.: *Hitchcock 1012* (GH, MICH, MO, NY, US). **Kentucky.** Bell Co.: *Mackenzie 922* (MO, NY). **Louisiana.** Caddo Parish: *Cocks* July 1909 (NO). **Maryland.**

FIG. 1–25. Diagrammatic silhouettes of representative mid-cauline leaves (first and second item in each figure trio) and sepal (third item) of *Ascyrum hypericoides* var. *hypericoides* arranged to show the continuous gradation of shape and size which exists in this species. Fig. 1—Bahama Islands; Fig. 2—Cuba; Fig. 3a—Georgia, Lincoln Co.; Fig. 4a, 12a, 13a, 24b, and 25b—Georgia, Clarke Co.; Fig. 5a—Georgia, Worth Co.; Fig. 6a—Georgia, Talbot Co.; Fig. 7a and 20b—Georgia, Wheeler Co., about 20 ft. from each other; Fig. 8a and 21b—Georgia, Johnson Co., about 150 ft. apart; Fig. 9—Honduras; Fig. 10—Guatemala; Fig. 11a and 19b—Georgia, Newton Co., about 40 ft. apart; Fig. 14—Dominican Republic; Fig. 15—Jamaica; Fig. 16—Bermuda; Fig. 17—Mexico, Vera Cruz; Fig. 18b—Georgia, Thomas Co.; Fig. 22b—Virginia, Accomac Co.; Fig. 23b—Texas, Fannin Co. (a—sunny, dry habitat; b—shady, moist habitat).

Anne Arundel Co.: *Bartlett 1838* (MICH). **Massachusetts.** Nantucket Co.: *Pennell 11174* (PH). **Mississippi.** Union Co.: *Seymour* 23 Sept. 1891 (DUKE). **Missouri.** Christian Co.: *Steyermark 22969* (F, MO). **New Jersey.** Salem Co.: *Adams 1839* (GH, US). **New York.** Nassau Co.: *Ferguson 7798* (GH). **North Carolina.** Macon Co.: *Fox & Godfrey 1243* (GA, GH, NCSC). **Ohio.** Adams Co.: *Roads* 24 Sept. 1933 (OS). **Oklahoma.** Oklahoma Co.: *Waterfall 2519* (GH, OKL). **Pennsylvania.** York Co.: *Adams 4380* (GH). **Tennessee.** Cannon Co.: *Svenson 9286* (GH). **Texas.** Henderson Co.: *Lundell & Lundell 9574* (GH, MICH, NY, SMU). **Virginia.** Wise Co.: *Seymour 91724* (DUKE, GH, MO, SMU). **West Virginia.** Cabell Co.: *Gilbert 548* (DUKE, F, GH, MO, NY, PENN, PH, SMU, TENN, WVA).

3. **Ascyrum stans** Michx. Fl. Bor.-Am. **2:** 77. 1803.

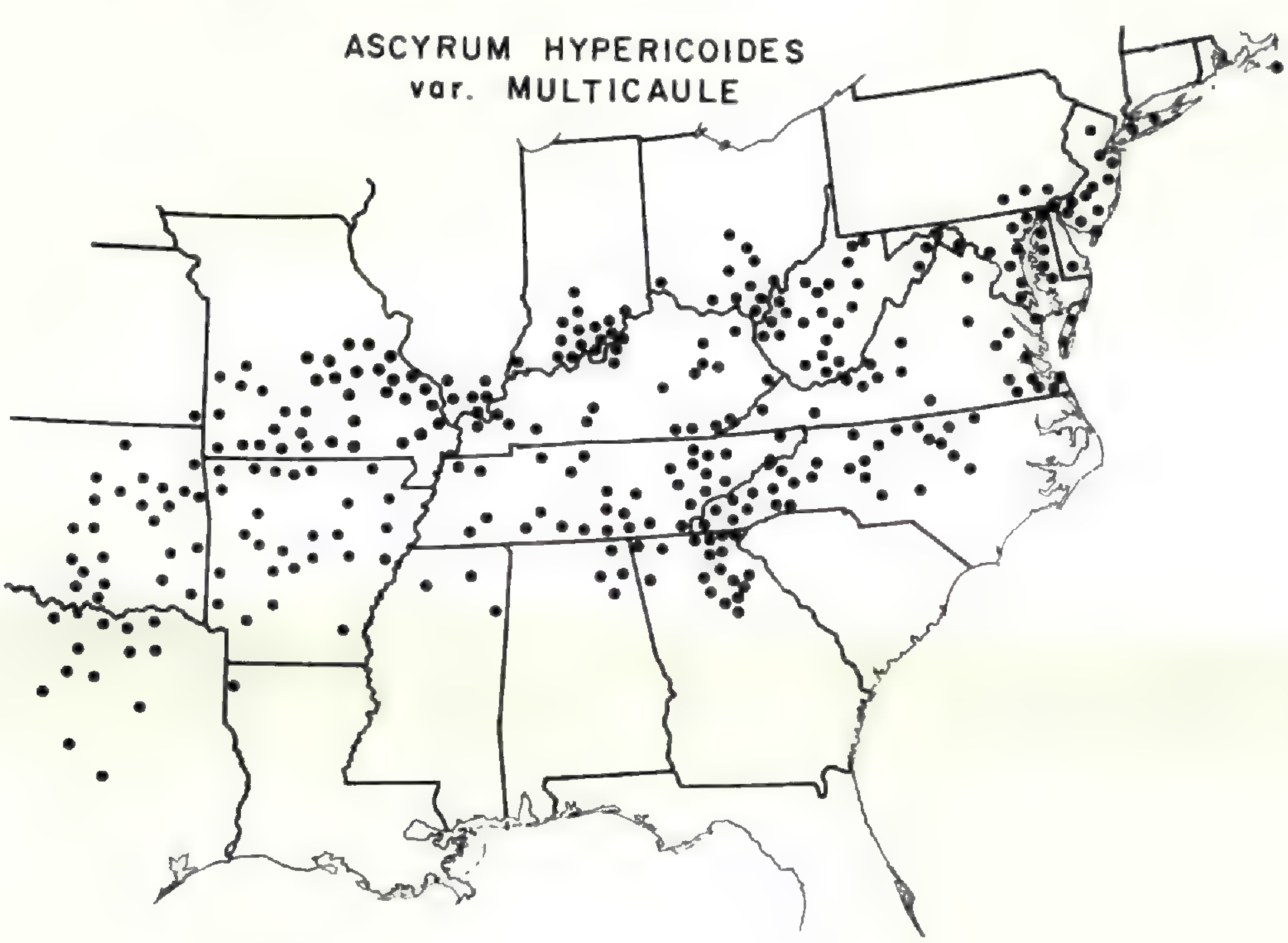
A. Hypericoides L. Sp. Pl. **1:** 787. 1753, as to Plukenet syn. (fide T. & G. Fl. N. Am. **1:** 671. 1840). *A. grandiflorum* Raf. Fl. Ludovic. 87. 1817. *A. cuneifolium* Chapm. Fl. Southeastern U. S. ed. 2, suppl. 2, 680. 1892; ed. 3, 56. 1897.

Erect shrub (20–)30–80(–100) cm. tall, stems simple or sparsely branched. Leaves spreading to ascending, (12–)18–30(–36) mm. long, (6–) 8–12(–16) mm. wide, elliptic-oblong, obovate in "stump sprouts," obtuse to acute, thick-coriaceous, slightly glaucous above, sessile, margins slightly revolute, midvein slightly elevated beneath, venation otherwise obscure, glands on lower surface of leaf about 0.050–1.025 mm. in diameter. Pedicels (3–)5–10(–12) mm. long, with lanceolate bractlets 3–5 mm. below the base of the calyx. Outer sepals (9–)10–17(–20) mm. long, (8–)9–14(–18) mm. wide, broadly ovate or suborbicular, cordate at base, acute, coriaceous, with 6–7 conspicuous lateral veins. Inner sepals 7–14 mm. long, 2–3(–4) mm. wide, lanceolate. Petals showy, (11–)12–17(–18) mm. long, (6–)7–10(–12) mm. wide, obliquely obovate, one petal often broadly lanceolate. Styles 3, rarely 4, distinct, spreading. Capsule exserted at maturity. Flowering during July to September. Type locality: "Hab. in Va." Type: presumably in the Michaux Herbarium, Muséum d'Histoire Naturelle de Paris, not seen.

Distribution: Dry to moist sandy woods, bogs, meadows, and pine flatwoods, from New Jersey and eastern Pennsylvania southward on the Coastal Plain into Florida and westward into Texas, southeastern Oklahoma, southern Arkansas, the Cumberland Plateau of Tennessee northward into McCreary and Laurel counties of Kentucky, the Piedmont and mountains of Alabama, Georgia, South Carolina, and North Carolina. MAP 4.

While the geographic range is quite extensive, *Ascyrum stans* does not appear to be very abundant anywhere. For example, in the six counties in Georgia in which I have observed the species, only a few widely scattered plants were seen. Although a species with showy flowers, it has not been collected as frequently as other less conspicuous members of the genus.

MAP 4
ASCYRUM STANS


MAP 5
ASCYRUM HYPERICOIDES
var. MULTICAULE

Ascyrum cuneifolium was segregated from *A. stans* by Chapman in 1892. Evidence is presented below which indicates that *A. cuneifolium* does not merit taxonomic recognition. As defined by Chapman, the differences between *A. cuneifolium* and *A. stans* are as follows:

A. cuneifolium	*A. stans*
1. leaves cuneate, sessile, one-half to three-fourths inch long	1. leaves oblong, closely sessile, one inch long
2. flowers long-peduncled	2. flowers short-peduncled
3. outer sepals orbicular, shorter than the obovate petals, twice as long as the oblong capsule	3. outer sepals round-cordate, as long as the obovate petals and oblong capsules

The length of the leaves cannot be used to separate *A. cuneifolium* from *A. stans* because the upper leaves of the latter species often fall within the 0.5 to 0.75 inch size range. "Peduncle" (pedicel) length is of no value as a distinguishing characteristic. In length the pedicels of *A. stans* range from 3 to 12 mm., while those of Chapman's type vary from 4 to 13 mm. Although no definite pedicel lengths were presented by Chapman, the above measurements are sufficient to indicate that two species cannot be separated on this basis.

The ratio of petal to sepal length is another character of questionable value. The several Chapman specimens of *Ascyrum cuneifolium* available in this study and numerous specimens of typical *A. stans* from throughout the range exhibit a sepal-petal ratio of about 1 : 1.

Efforts to locate characters other than those presented by Chapman by which to define *Ascyrum cuneifolium* were unsuccessful. Differences in the venation of the outer sepals, known elsewhere in the genus to be of taxonomic significance, were found to be very minor, both *A. stans* and Chapman's segregate having 6–7 main veins. The most distinctive feature of the Chapman specimens is their short stature but this appears to be a teratological, fire-induced condition.

REPRESENTATIVE SPECIMENS.—**Alabama.** Mobile Co.: *Graves 697* (MO, US). **Arkansas.** Pike Co.: *Demaree 9777* (GH, MO, NY). **Delaware.** New Castle Co.: *Tatnall 1959* (GH, PENN). **Florida.** Columbia Co.: *Nash 2489* (F, FLAS, GH, MICH, MO, NCU, NY, OS, US). **Georgia.** Douglas Co.: *Cronquist 5559* (GA, GH, NO, NY, PH, SMU, US). **Kentucky.** McCreary Co.: *McFarland & James 48* (DUKE, GA, GH, IND, MO, NY, PENN,

PH, TENN, WVA, US). **Louisiana.** Beauregard Parish: *Correll & Correll 9681* (DUKE, F, GH). **Maryland.** Prince George Co.: *Dowell 6464* (GH, MO, NY). **Mississippi.** Harrison Co.: *Tracy 3452* (F, MICH, MO, NY, OS, US). **New Jersey.** Camden Co.: *Long 25144* (GH). **North Carolina.** *Godfrey 5879* (GH, US). **Oklahoma.** LeFlore Co.: *Palmer 20595* (GH). **Pennsylvania.** Bucks Co.: *Diffenbaugh* 28 Aug. 1864 (GH). **South Carolina.** Clarendon Co.: *Godfrey & Tryon 1022* (GH, NY, US). **Tennessee.** Coffee Co.: *Svenson 4246* (GH, IND, PH). **Texas.** Houston Co.: *Palmer 12819* (GH, MO, US). **Virginia.** Princess Anne Co.: *Heller 1268* (F, GH, PENN, PH, US).

4. **Ascyrum edisonianum** Small, Man. Southeastern Fl. 868. 1933 (as Edisonianum).

Shrub 3–12 dm. tall, the stem usually dichotomously branched, the horizontal roots bearing erect adventitious shoots. Leaves sessile, spreading to ascending, 15–26 mm. long, 5–8(–11) mm. wide, linear-elliptic, acuminate, heavily glaucous above, only slightly so below, margins slightly revolute, midvein slightly elevated beneath, venation otherwise obscure, glands on undersurface of leaf about 0.025–0.050 mm. in diameter, the stem with two conspicuous reddish-colored glands at base of leaf. Pedicels 5–10 mm. long, the small lanceolate bractlets 3–5 mm. below the base of the calyx. Outer sepals (8–)9–13(–17) mm. long, (5–)6–8(–9) mm. wide, cordate, acuminate, venation inconspicuous. Petals showy, 11–18 mm. long, 6–11 mm. wide, obliquely obovate. Styles 3–4. Apparently flowering all year. Type locality: "21 miles east of Arcadia, Florida." Type: *Hand 118* (NY).

Distribution: Open prairies and pinelands, Highlands, Glades, and DeSoto Counties, Florida. MAP 1.

This distinctive species has the most restricted geographic range of any member of the genus. It is known from only three counties in south-central Florida. Locally, *Ascyrum edisonianum* is very abundant, often forming thick stands an acre or more in extent. This "colonial" aspect results from the formation of numerous adventitious shoots at frequent intervals along the characteristically horizontal roots of the plants. No other species of *Ascyrum* is known to produce such roots.

The related species, *Ascyrum tetrapetalum*, grows in the same general area. *Ascyrum edisonianum* is readily distinguished by the sepals and sessile leaves which are distinctly different in shape. The sepals and closely clasping leaves of *A. tetrapetalum* are essentially alike in shape. *Ascyrum edisonianum* is apparently most closely related to *A. stans*, as indicated by the general similarities of the sepals and leaves enumerated in the

key. These species are distinguished, however, by the following contrast of characters:

A. edisonianum	*A. stans*
1. adventitious shoots present	1. absent
2. venation of outer sepals inconspicuous	2. conspicuous, each sepal with 6–7 main veins
3. outer sepals cordate, acuminate, 1.4–1.9 times as long as broad, 5–8 mm. wide	3. broadly ovate or suborbicular, obtuse or acute, 1.0–1.3 times as long as broad, 10–14 mm. wide
4. leaves heavily glaucous above	4. only slightly glaucous
5. branching typically dichotomous	5. not dichotomous
6. number of glands per unit area on lower leaf surface one-half that of *A. stans*, these 0.025–0.050 mm. in diameter	6. glands twice that of *A. edisonianum*, 0.050–1.025 mm. in diameter.

The type of *Ascyrum edisonianum* (*Hand 118*) consists of two slides of flower dissections. Although these flowers were most likely taken from Hand's specimen number 119 (NY), the latter was not mentioned by Small in the original description. It is clear, however, that these two Hand numbers represent the only specimens available to Small in the preparation of the original description and that Hand's number 119 must have been utilized for the description of the vegetative parts. For practical purposes, both of Hand's numbers, 118 and 119, are here regarded as comprising the type. The failure of Small to cite specifically the latter probably represents merely an oversight.

Due to the paucity of existing specimens of this species, topotypes have been collected and widely distributed.

Additional collections from the areas adjacent to Highlands County would help to establish the actual geographic limits of the species.

SPECIMENS STUDIED.—**Florida.** DeSoto Co.: 20 miles east of Arcadia, *Adams 139* (GA, GH, NCSC). Glades Co.: Hailpen, Fisheating Creek, *Brass 14824* (GH). Highlands Co.: 21 miles east of Arcadia, *Hand 118*-TYPE (NY); 21 miles east of Arcadia, *Hand 119* (NY); near Hicoria, *McFarlin 10207* (GH); without definite locality, *Schallert* 5–3–41 (NY); 21 miles east of Arcadia, *Adams & Testasecca 100* topotype (DUKE, F, FLAS, FSU, GA, MICH, MO, NCSC, NY, PH; do not show adventitious shoot character); 21 miles east of Arcadia, *Adams 140* topotype (GH; duplicates to be distributed show the adventitious shoots).

5. **Ascyrum tetrapetalum** (Lam.) Vail in Small, Fl. Southeastern U. S. **1:** 785. 1903.

Hypericum tetrapetalum Lam. Encyc. Meth. Bot. **4:** 153. 1797. *A. amplexicaule* Michx. Fl. Bor.-Am. **2:** 77. 1803. *A. stans β* Choisy, Prodr. Hyper. 61. 1821. *A. Cubense* Griseb. Cat. Pl. Cuba, 40. 1866.

Erect shrub (2–)3–6(–8) dm. tall, stems typically dichotomously branched or forked above. Leaves spreading to ascending, (5–)15–25(–30) mm. long, (4–)7–15(–22) mm. wide, ovate-cordate, often broadly so, acute to acuminate, sessile and strongly clasping, thick, coriaceous, slightly glaucous, margins slightly revolute, midvein slightly elevated beneath, venation otherwise obscure. Pedicels (4–)5–10(–15) mm. long, bractlets basal. Outer sepals (9–)11–15(–17) mm. long, (6–)8–10(–13) mm. wide, ovate-cordate, acute or short-acuminate, resembling the leaves in shape, coriaceous, in drying of a lighter color than the leaves. Inner sepals (7–)9–11(–12) mm. long, (2–)2.5–3.5(–4.5) mm. wide, linear-lanceolate. Petals showy, (8–)10–15(–18) mm. long, (5–)6–12(–17) mm. wide, obliquely obovate. Styles 3, rarely 4, more or less distinct. Flowering during spring to fall or all year in southern peninsular Florida.. Type locality: "Hab. in Florida." Type: in the Lamarck Herbarium, Muséum d'Histoire Naturelle de Paris (GH, photograph seen).

Distribution: Low, sandy pinelands, edges of woods and savannas, Coastal Plain, southern Georgia and peninsular Florida; also Pinar del Rio, Cuba. MAP 2.

This species has occasionally been confused with *Hypericum myrtifolium* Lam., both of which often occur in the same habitats. Although the two species bear a superficial resemblance to one another, the generic differences are sufficient to distinguish them by any except the most casual observer.

The type of *Ascyrum Cubense* Griseb. was examined in the present study and is clearly referable to *A. tetrapetalum*, a conclusion also reached by Coulter (1886, 1897).

Although the range in the United States of *Ascyrum tetrapetalum* is well-documented in American herbaria, no specimens from Cuba other than the type of *A. Cubense* were available. According to Bro. Alain[2] of the Colegio "De La Salle," Habana, Cuba, *A. tetrapetalum* "has been found several times in the savannas of our province of Pinar del Rio . . . in the region that goes from South of the city of Pinar del Rio to the Guanahacabibes Peninsula."

REPRESENTATIVE SPECIMENS: **Cuba.** Without exact locality but very likely from Pinar del Rio, *Wright 2128*, TYPE of *A. Cubense* Griseb.

[2] Letter to Dr. W. H. Duncan, Dept. of Botany, University of Georgia, dated 13 November 1955.

(GH, MO). United States. **Florida.** Bay Co.: *Webster & Wilbur 3625* (SMU, US); Clay Co.: *Moldenke 160* (DUKE, MO, NY, PENN, US); Duvall Co.: *Curtiss 245* (F, GH, MISSA, MO, PENN, PH, NY, US); Lake Co.: *Nash 1977* (F, GH, MICH, MO, NCU, NY, PH, US); Lee Co.: *Moldenke 969* (DUKE, MO, NY, PENN). **Georgia.** Camden Co.: *Small & DeWinkeler 9692* (US); Glynn Co., *Wiegand & Manning 1999* (GH); Irwin Co.: *Wilbur 3074* (NCSC, SMU); Long Co.: *Duncan 19278* (GA); McIntosh Co.: *Cronquist 5363* (GA, GH, NY, US).

Doubtful and Excluded Species

Ascyrum calcinium Poir. Encyc. Tabl. **3:** 199. 1823. Definitely not an *Ascyrum.*

Ascyrum coriaceum Moench. Meth. 130. 1794. Definitely not an *Ascyrum.*

Ascyrum cruciatum St. Lag. in Ann. Soc. Bot. Lyon **7:** 69. 1880, an avowed renaming of *A. Crux-Andreae* L. (Sp. Pl. **2:** 788. 1753), which Fernald (1936) equated with *Hypericum mutilum* L.

Ascyrum glandulosum Moench. Meth. Suppl. 42. 1802. Definitely not an *Ascyrum.*

Ascyrum humifusum Labill. Nov. Holl. Pl. **2:** 33, t. 175. 1806. Definitely not an *Ascyrum.*

Ascyrum involutum Labill. Nov. Holl. Pl. **2:** 32, t. 174. 1806. Definitely not an *Ascyrum.*

Ascyrum monogynum Moench. Meth. Suppl. 42. 1802. Definitely not an *Ascyrum.*

Ascyrum sibiricum Poir. Encyc. Tabl. **3:** 200. 1823. Definitely not an *Ascyrum.*

Ascyrum simplex Zeyh. ex Turcz. in Bull. Soc. Nat. Mosc. **31:** 389. 1858. This name definitely refers to an *Ascyrum* but the description is inadequate for determination of the exact species.

Ascyrum tetragonum Moench. Meth. 130. 1794. Definitely not an *Ascyrum.*

Ascyrum villosum L. Sp. Pl. **2:** 788. 1753. Definitely not an *Ascyrum.* No member of this genus has the character "foliis hirsutis."—Gray Herbarium, Harvard University.

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Hedyotis minima f. albiflora.—On April 6, 1955, when the author was collecting with Dr. Ronald L. McGregor, a colony of pure white flowered *H. minima* was discovered on shallow sandy soil, over sandstone, in a clearing of an upland scrub oak forest, in Woodson County, Kansas. The exact location was: Sec. 32, T25S, R15E. The specimens were scattered in a small area of this woodland.

Hedyotis minima (Beck) T. & G., forma **albiflora,** f. nov.—Haec forma a planta typica speciei corollis albis recedit. This form differs from the typical form of the species in having white corollas. Type specimen *Lathrop and McGregor 35*, is in the Herbarium of the University of Kansas.—Earl Lathrop, department of botany, university of kansas, lawrence, kansas.

A NEW RADIATE HYMENOPAPPUS FROM MEXICO

U. T. Waterfall

While on a collecting trip in August, 1956, which, in Mexico, extended from Ciudad Juarez to Durango to Mazatlán to Nogales, a species of *Hymenopappus* was found in grassland 11 miles west of Durango. It is a quite distinct species comparable only with *H. biennis* Turner,[1] of southern New Mexico and the adjacent Guadalupe Mountains of Texas, and with *H. radiatus* Rose, an endemic of southern Arizona.

The receptacle is naked. There are 15–25 white rays, 5–8 mm. long and 3–4 mm. wide, whereas *H. biennis*, its nearest relative, has 8 rays ca. 15 mm. long and 6–7 mm. wide, and *H. radiatus* has 8 rays which are ca. 15 mm. long and 5–10 mm. wide. The new species has 130–150 disc flowers which are about 3 mm. long, with a glabrous tube ca. 1.2 mm. long, a funnelform throat ca. 1 mm. long, and lobes ca. 0.8 mm. long, with glabrous, 4-sided achenes (which may have a few appressed or ascending hairs on the margins) 2.5–3 mm. long, and with pappus-scales 0.6–1.0 mm. long, oblong or oblong-spathulate, blunt and incurved at their apices. Contrastingly, *H. biennis* has 40–60 disc flowers, 3–3.5 mm. long, a densely glandular tube 1.5 mm. long, and a campanulate throat 1.5–2 mm. long, achenes 4 mm. long, and pappus obsolete to 0.2 mm. long. *H. radiatus* has a similar number of disc flowers with a campanulate throat, and pappus-scales 0.4–0.6 mm. long. The principal involucre bracts of the new species are 3–4 mm. long, lanceolate-ovate with attenuate tips; the heads are on peduncles 0.5–1 cm. long. In *H. biennis* the involucre bracts are 5–8 mm. long with heads on peduncles 1–6 cm. long, while in *H. radiatus* the bracts are 7–8 mm. long with heads on peduncles 6–8 cm. long. The stem is branched above, the branches being 10–20 cm. long, rebranched 2 or 3 times near their apices, with each of these branchlets bearing 3–5 heads. The stems and branches are leafy, the leaves somewhat reduced upward and bipinnately divided into oblongish segments. The plants are covered to a varying extent with short curled or curved hairs, in addition

[1] Turner, Billie L. *A Cytotaxonomic Study of the Genus Hymenopappus.* Rhodora 58. 1956.

to which there are prominent stipitate-glandular (knobbed) hairs. The latter are least evident on the older parts, and most prominent on the younger parts of the stems, on the leaves and on the involucre bracts. On some of the leaf segments only the glandular hairs are evident. Since the stipitate glands are not characteristic of any other species of this genus, the following name is given.

Hymenopappus glandulopubescens Waterfall, sp. nov. Planta 75–90 cm. alta, stipitato-glandulosa; caulibus foliatis, ramosis; foliis bipinnatis, segmentis oblongo-ovatis vel linearibus, stipitato-glandulosis; pedunculis 5–10 mm. longis; capitulis radiatis; involucri squamis 3–4 mm. longis, lanceolato-ovatis, attenuatis; ligulis 15–25, albis, 5–8 mm. longis, 3–4 mm. latis; floribus disci 130–150, infundibuliformibus, 3 mm. longis; acheniis glabris, 4-angulatis, 2.5–3 mm. longis; pappi paleis 8, oblongis vel spathulato-oblongis, 0.6–1 mm. longis.

The TYPE of *H. glandulopubescens* is *Waterfall 12576*, grassy flat, 11 miles west of Durango, Durango, Mexico, Aug. 10, 1956 in the Herbarium of Okla. A. & M. College. An ISOTYPE is in the Gray Herbarium of Harvard University.

This is the only radiate species of *Hymenopappus* known from Mexico. It is widely separated from its nearest radiate relative, *H. biennis* Turner, of the mountains of southern New Mexico and adjacent southwestern Texas. It is the only species of the genus known from Durango, the nearest ones being *H. flavomarginatus* Johnston from Coahuila, Nuevo León and San Luis Potosí, and representatives of *H. mexicanus* Gray from San Luis Potosí, or, about equidistant northward, the same species from northern Chihuahua (*ibid:* 212). This brings to a total of 6 the number of species known from Mexico, the others being *H. scabiosaeus* var. *corymbosus* (T. & G.) Turner and *H. flavescens* var. *cano-tomentosus* Gray, both of northern Chihuahua with their principal area of distribution to the northward (*ibid.:* 298), and *H. filifolius* var. *lugens* (Greene) Jepson from northern Baja California (*ibid.:* 231).—DEPT. OF BOTANY AND THE RESEARCH FOUNDATION, OKLAHOMA A. & M. COLLEGE, STILLWATER, OKLAHOMA.

A New Variety of Stipulicida setacea.—**Stipulicida setacea** Michx. var. **setacea.** *S. setacea* Michx. Fl. Bor. Am. 1: 26, t. 6. 1803. *S. filiformis* Nash, Bull. Torr. Bot. Club **22:** 148. 1895. Type: vicinity of Eustis, Lake County, Florida, *Nash 14*, 12–31 March 1894 (NY). Isotypes: GH, NY.

Distribution: in the Coastal Plain area from North Carolina southward through central and east Florida, westward into Mississippi.

Stipulicida setacea Michx. var. **lacerata** James, var. nov.[1] Type: Dunedin, Pinellas County, Florida, *Tracy 6828*, 14 April 1900 (GH). Isotype: NY.

Sepala lacerata, margines conspicui, hyalini, plerumque rubro-brunnei maculati; sepala interiora obovata, emarginata, 1.5–2 mm. longa, circa 1 mm. lata; sepala exteriora elliptica vel ovato-elliptica, plerumque aliquanto breviora et angustiora quam sepala interiora, apice mucronata. Sepals lacerate, the conspicuous hyaline margins usually red-brown mottled; inner sepals obovate, emarginate, 1.5–2 mm. long, ca. 1 mm. wide; outer sepals elliptic to elliptic-ovate, generally somewhat shorter and narrower than the inner, the apices mucronate.

Habitat and distribution: dry sandy soils of the Tampa Bay area of Florida, southeastward to the glades; also Isle of Pines, Cuba.

Specimens examined. **Florida:**—Highlands Co.: Sebring, *Hunnewell 8955* (GH); Kissimee Prairie, e. of Lake Istokpoga, *Small 10898* (GH); prairie n. of Istokpoga Creek, *Small 10899* (NY). Hillsborough Co.: Sutherland, *Barnhart 2742* (NY); Tampa, *Britton 72* (NY); Tampa, *Churchill*, 31 March 1897 (GH); Tarpon Springs, *Churchill*, 23 March 1923 (GH); *Fredholm 6283* (GH); Tampa, *Garber*, May 1876 (NY); near Tampa Bay, *Leavenworth* (NY). Lee Co.: Myers, *Hitchcock 5* (GH, NY); Fort Myers, *Moldenke 915* (NY). Manatee Co.: "ad littora maris, prope fl. Manate. Florida austr. occ.," *Rugel 61* (GH). Pinellas Co.: *Frank*, Dec.–Apr. 1900 (NY). Sarasota Co.: Sarasota, *Perkins*, 3 Jan. 1943 (GH). **Cuba:**—Isle of Pines: vicinity of Los Indios, *Britton 14200* (GH, NY).

Although very similar in habit and general appearance to the type variety, var. *lacerata* is readily distinguished from it by its lacerate sepals. In addition, the outer sepals are mucronate. The two varieties are essentially allopatric. The collection of F. W. Hunnewell (no. 8955, Highlands Co., Fla.), from the eastern limits of the range of var. *lacerata*, was the only one seen which consisted of plants of both varieties. The specimen of var. *lacerata* in this collection is somewhat atypical. This, in addition to the fact that there is not a clear-cut discontinuity in the shape of the sepals, indicates that there may be some gene flow between these taxa. It seems worthy to remark also that the specimens cited from Cuba do not have as strongly lacerate sepals as those of Florida.—Charles W. James, gray herbarium, harvard university.

[1] The Latin diagnosis was kindly prepared by Dr. R. C. Foster.

HYMENOCALLIS LITTORALIS FROM FLORIDA.—Recently Traub[1] verified the holotype of *Hymenocallis palmeri* S. Wats., as *Palmer 554* (GH). This search revealed two unidentified herbarium sheets with specimens, *Palmer 553* (GH), also collected in 1874 at Biscayne Bay, Florida; and No. "553" (GH), grown from bulbs of No. 553.

The specimens,[2] as follows have been identified as *Hymenocallis littoralis* (Jacq.) Salisb.

(a) Palmer. No. 553, Biscayne Bay, Fla., 1874. There are two detached flowers and one leaf on this sheet.[3]

(b) Palmer. No. "553," grown from Palmer's bulbs of No. 553 (in hort. Botanic Garden, Harvard University) Oct. 1878. There is one detached flower, and one leaf on this sheet. In the packet attached to the sheet there are two items. One is a rough drawing of the flower. The other is a letter sheet with descriptive information under date of Sept. 6, 1875. The qualitative data has been incorporated as far as possible into the description that follows, but the quantitative data, which appears to be roughly taken, is disregarded, and new measurements have been taken from the plant parts on the two herbarium sheets.

Hymenocallis littoralis (Jacq.) Salisb. in Trans. Hort. Soc. Lond. **1:** 338. 1812; Baker, Amaryll. 123. 1888; Sealy, Kew Bull. pp. 227–229. 1954.

Bulb large, not rhizomatous. *Leaves* "thick, deep green," lorate or wide lorate in the upper part, apex acute, gradually narrowing below the middle, 40.2–57 cm. long, 1.2–2 cm. wide at the base, 2.7–3.7 cm. wide above the middle, narrowing to the acute apex. *Scape* length unknown. *Spathe* unknown. *Umbel* several-flowered. *Ovary* 2 cm. long, 9 mm. in diam. *Ovules* 8 per locule. *Tepaltube* 13–15 cm. long, slender, greenish. *Tepalsegs* white with greenish tips, margins involute, appressed to the staminal cup at the base, then spreading and recurved, up to 11.5 cm. long, 4.2 mm. wide. *Staminal cup* pure white, 2.3–2.6 cm. long, broadly funnel-shaped, "truncate and entire between the filaments" according to Sereno Watson, but the margins appear to be sometimes very slightly irregularly toothed and/or indented. *Filaments* 5.6 cm. long, green. *Anthers* about 2.1 cm. long, green, with orange-brown pollen. *Style* green, subequaling the tepalsegs, overtopping the stamens. *Stigma* capitate.

This is the first report of *Hymenocallis littoralis* from the United States. All previous reports are from Guiana, Colombia and Mexico.—HAMILTON P. TRAUB, LA JOLLA, CALIFORNIA.

[1] TAXON 5: 195–196, 1956.

[2] The help of Dr. Rollins in sending the specimens for study is gratefully acknowledged.

[3] Sereno Watson in 1874 had written on the sheet, "new sp.," but he never published it.

Fraser's Catalogue Again.—Dr. Shinners' recent further comments about the names in Fraser's Catalogue (Rhodora **58**: 281–289. 1956) prompt me to make a brief reply. The opposing positions as to the authorship of the names in the catalogue and the validity of the catalogue as a medium of publication have now been sufficiently expounded; other botanists will of course decide for themselves what conclusion is required by the evidence. Only some of the specific consequences of accepting Fraser's Catalogue as a valid medium of publication remain to be re-examined.

Dr. Shinners states that if the catalogue is accepted, the name *Oenothera caespitosa* Sims must be replaced by *Oe. cespitosa* Nutt., *Oe. missouriensis* Sims must be replaced by *Oe. macrocarpa* Nutt., *Gaillardia aristata* Pursh must be replaced by a new combination based on *Virgilia grandiflora* of Fraser's Catalogue, and *Grindelia squarrosa* (Pursh) Dunal must be replaced by a new combination based on *Thuraria herbacea* of Fraser's Catalogue. The list becomes less formidable when the items are considered individually. The change from *Oe. caespitosa* Sims to *Oe. cespitosa* Nutt. should not cause great inconvenience. The name *Oe. macrocarpa* Nutt. must indeed replace *Oe. missouriensis* Sims; I see no escape from this. There is already a *Gaillardia grandiflora* Hort. ex Lemaire, Ill. Hort. 4: pl. 139. 1857, fully described and illustrated; *Virgilia grandiflora* Nutt. may therefore properly fall into the synonymy of *Gaillardia aristata* Pursh. The name *Thuraria herbacea* may in my opinion be treated as a nomen dubium, insufficiently described to make its application unmistakably clear. Thus only one significant nomenclatural change is entailed by accepting Fraser's Catalogue as a valid medium of publication.

Botanists who have to deal with these names will doubtless wish to consult the original descriptions and draw their own conclusions. The catalogue in its entirety was reprinted by E. L. Greene in Pittonia 2: 114–119. 1890.—Arthur Cronquist, the New York Botanical Garden.

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A REVISION OF THE VERNAL SPECIES OF HELENIUM (COMPOSITAE)[1]

HOWARD F. L. ROCK

IN the year 1818, Thomas Nuttall established the genus *Leptopoda* (Gen. N. A. Pl. **2:** 174.) which was based on a *Helenium*-like plant, *Leptopoda Helenium* Nutt., from Southeastern United States. The genus, so named "in allusion to the elongated peduncle" was distinguished from *Helenium* by the neutral and sterile ray florets and by the awnless pappus scales which numbered more than five per achene. In addition, Nuttall distinguished *Leptopoda* from both *Gaillardia* Fougx. and *Balduina* Nutt. on receptacular features. The receptacle in *Leptopoda* is naked, in contrast to the appendaged nature of the receptacle in both *Gaillardia* and *Balduina.* For these four genera, *Helenium*, *Leptopoda*, *Gaillardia*, and *Balduina*, plus *Actinella* Juss. ex Nutt., Nuttall proposed the name GALARDIAE (l. c.) which he offered as a "very natural group of genera."

The genus *Leptopoda* is not recognized in the current taxonomic treatments and literature, but, instead, the species formerly placed in *Leptopoda* now reside in the genus *Helenium.* This species-group is presently acknowledged to be a portion of the genus *Helenium* that is characterized by the perennial, vernal-flowering habit, the neutral and sterile rays and a geographic distribution of the species-group that is confined to southeastern United States. A revisional study of the genus *Helenium* by the author has revealed that the problems involved are not only confined to those associated with specific or subspecific

[1] A portion of a dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Graduate School of Arts and Sciences, Duke University.

taxa. Indeed, the generic limits of *Helenium* have been amplified by the inclusion of so many diverse species-groups that the genus threatens to ultimately encompass a goodly portion of the subtribe HELENIINAE, especially parts of the TETRANEURANAE and GAILLARDIANAE as recognized by Rydberg (N. A. Fl. **34** (2): 100–140. 1915.) The present revision, then, is part of the larger revisional study pertaining to the genus *Helenium*, excluding, for the present, that portion of the genus (*Cephalophora* Cav. and *Actinea* Juss.) which occurs in South America.

Historical Account

Although the formal history related to *Leptopoda* began with Nuttall's description of the genus in 1818 (l. c.), at least one species of the vernal portion of *Helenium* was known prior to that date. Thomas Walter, in his *Flora Caroliniana* of 1788, described the species *Helenium vernale* (cf. Rhodora **58:** 311–317. 1956.) Fifteen years later, in 1803, Michaux, either unaware of Walter's *Flora* or else ignoring it, redescribed *Helenium vernale* (in part) as *Galardia fimbriata* (Fl. Bor.-Am. **2:** 133.) Michaux's collection of *Galardia fimbriata*, at the Muséum National d'Histoire Naturelle in Paris reveals, however, that he had utterly confused two vernal species of *Helenium; Helenium vernale* Walt. and *H. pinnatifidum* (Nutt.) Rydbg. (a species that was to be described later as *Leptopoda puberula* Macbride in Ell.). The annotations and labels by Michaux that accompany the mixed specimens included on the type sheet, as well as the published description, indicate clearly that Michaux made no distinction between the two elements. Michaux's *Galardia fimbriata* can only be considered as a binomial which encompasses the two species *H. vernale* and *H. pinnatifidum*. At the time that Nuttall established *Leptopoda* and described *L. Helenium*, he made no reference to Walter, though *L. Helenium* is a synonym of *H. vernale*. He did cite Michaux's *G. fimbriata* with a query. At the same time, Nuttall observed that *Leptopoda* was "A genus much more nearly allied to *Helenium* than *Galardia*, but connecting both."

James Macbride, the collaborator with Elliott, was the first to make the distinction between the two confused species. In Elliott's Sketch (Bot. S. C. & Ga. **2:** 445. 1823), these dis-

tinctions are clearly drawn, together with pertinent observations made on the two species by Macbride in field studies. The final result was that Macbride renamed Nuttall's *L. Helenium* as *L. decurrens* and described the second species as *L. puberula*, mis-identifying it with Walter's *H. vernale* and incorrectly deciding that it was completely equivalent to Michaux's *G. fimbriata.*

During the interval between Elliott's *Sketch* and Nuttall's renewed activity with the genus, Cassini maintained *Leptopoda* in his various works and was in agreement with Nuttall's proposal of the group of related genera, the GALARDIAE. Lessing affirmed the position taken by both Nuttall and Cassini. Fortunately, Rafinesque did little during this period to complicate matters. He published an illegitimate, substitute name for the genus, *Leptophora* (Am. Mo. Mag. Crit. Rev. **4:** 195. 1819)—misprinted as *Leptocarpha* by Endlicher (Gen. p. 1383. 1841)—and described the species *Helenium flexuosum* (New Fl. N. A. (part 4): 81. 1836) which has proved to be both valid and legitimate. In 1841, Nuttall described three more species of *Leptopoda,* making no mention of either Macbride or Elliott, although A. P. DeCandolle had clearly cited Macbride and Elliott in the treatment of *Leptopoda* prepared for the Prodromus (**5**: 653. 1836.) In the same article (Trans. Am. Phil. Soc. ser. 2. **7:** 372–373, 384–385), Nuttall described two additional species, *H. nudiflorum* and *H. micranthum.* However, both of these species are conspecific with Rafinesque's earlier *H. flexuosum.* Again, as in the case of Macbride and Elliott, Nuttall made no mention of Rafinesque. The lack of any published consideration by Nuttall concerning the work of others has increased the synonymy unduly and has often resulted in a confused application of the binomials involved.

The appearance of Torrey and Gray's *Flora of North America* (**1:** 386–388. 1842) provided the first comprehensive account of the genus *Leptopoda.* In this account, they recognized six species and two varieties. Three of the species and one of the varieties they described as new, although one of the species, *L. brachypoda,* was described as new in order to accommodate the transfer of Nuttall's *Helenium nudiflorum* to the genus *Leptopoda.* They attempted to straighten out the complicated synonymy of the species and in many ways succeeded, even

though they were to provide a further complication by picking up the epithet *fimbriata* for a species of *Leptopoda* from Texas, asserting that it was probably not the same as Michaux's *Galardia fimbriata*.

There was a lull in the events related to *Leptopoda* until 1870. In that year, Alphonso Wood (Am. Bot. & Fl. 180. 1870.) transferred the species of *Leptopoda* to *Helenium*, formulating the Section LEPTOPODA for the former species of *Leptopoda* and the Section HELENIASTRUM for the "pistillate"-rayed species of *Helenium*. Asa Gray, stimulated by what he considered to be a somewhat indiscriminate merging of several genera with *Helenium* by Bentham (Gen. Pl. **2** (1): 1873), presented "An arrangement of the known species . . ." of *Helenium* in 1874 (Proc. Am. Acad. **9:** as a footnote beginning on page 202.) In this arrangement, Gray recognized *Leptopoda* as a section of *Helenium* and made the same combinations that A. Wood had made earlier, ascribing the combinations to himself, however, apparently deliberately ignoring Wood's earlier work. Gray's treatment recognized five species and a questionable variety in the Section LEPTOPODA. He described one of these five species as new, *H. Curtisii*, and renamed Nuttall's *L. Helenium* as *H. Nuttallii*. A sixth species, *H. nudiflorum* Nutt., he placed in the Section EUHELENIUM because of the branched habit, despite the neutral and sterile ray florets. For the Synoptical Flora of North America (**1** (2): 350–351. 1884), Gray repeated essentially the treatment of the Section LEPTOPODA that he proposed in 1874.

It was not until 1903 that another treatment of *Helenium* which included the neutral-rayed species appeared, even though in 1891, O. Kuntze renamed all the species of *Helenium*, categorically, as species of *Heleniastrum* [Mill.] in an abortive nomenclatorial tiff (Rev. Gen. Pl. part **1:** 341–342.) J. K. Small incorporated the description of two new species with his Manual treatment of the genus *Helenium* (Fl. SE. U. S. 1290–1292. 1903.) Small, following the position taken by A. Gray, placed *H. nudiflorum* Nutt. and his two newly described species, *H. polyphyllum* and *H. campestre*, in close alliance to *H. autumnale*. Nevertheless, *H. flexuosum* (incl. *H. nudiflorum* Nutt. and *H. polyphyllum* Small) and *H. campestre* Small have neutral

and sterile ray florets and so must be considered as proper species of the Section LEPTOPODA. P. A. Rydberg's treatment of the Southeastern vernal species of *Helenium* (N. A. Fl. **34** (2): 120–131. 1915) is essentially the same as Small's treatment of 1903 with the exception of two modifications. Primarily, Rydberg recognized that *H. nudiflorum* and *H. campestre* properly belonged with the spring-flowering group of *Helenium* species and secondarily, Rydberg recognized an additional taxon in the spring group for which he revived a Nuttallian epithet. It is to be noted that neither Small nor Rydberg used subgeneric divisions in their treatments of the genus. In the Manual of the Southeastern Flora (1459–1461. 1933), Small repeated his treatment of 1903 with Rydberg's modifications and while he did not recognize formal subgeneric categories he did arrange the species of the genus which occurred in the range of the manual into groups that are perhaps the equivalent of series.

Since the last treatment by Small, an historical account of the vernal species is rather brief. There have been a few shuffles in the nomenclature of the species by Moldenke (Bull. Torr. Bot. Club **62:** 230. 1935; Phytologia **1:** 169. 1935) and the description of an additional pair of species in the *nudiflorum* complex by M. L. Fernald (RHODORA **45:** 494. 1943.)

MORPHOLOGY AND TAXONOMIC CHARACTERS

One of the more apparent morphological observations that can be made concerning the genus *Helenium* (*sensu lato*) is that the species can be placed into two groups immediately on the basis of whether the stem is winged by the decurrent leaf-bases or not. All of the species that are currently placed in *Helenium* can be subjected to this test with the exception of one. This exception is *Helenium scaposum* Britt. As the epithet implies, this species is scapose, and it is endemic to the Isle of Pines, Cuba. The plant rarely exceeds 1 dm. in height and consists solely of a basal, perennial rosette surmounted by a single, monocephalous peduncle. The material available for study of this taxon is quite meagre and invariably consists of plants just beginning to flower so that the more mature floral features are quite unknown and can only be surmised. In the original

description, Britton states that *H. scaposum* is "A plant with quite the floral structure of *Helenium*, but its scapose habit is aberrant, resembling that of some *Tetraneuris* species." At this time, I would like to emphasize the apparent relationship of *H. scaposum* to the TETRANEURANAE of Rydberg and suggest that the most likely affinity of this species is with *Plateilema Palmeri* (A. Gray) Cockerell. However, until further study can be made, particularly with mature plants and greenhouse observation, the transfer of this taxon to any other genus would not seem advisable.

All of the vernal species of *Helenium* fall into the class of those having winged stems. For most of these, the winged nature of the stem does not serve as a useful taxonomic criterion for distinguishing between the various species. However, in one, *H. pinnatifidum*, the winging of the stem does serve as an aid to identification. In this species the winging on the stem is restricted to the mid-cauline leaves only and does not exceed 5 mm. in extent. Nevertheless, the decurrency of the mid-cauline leaf-bases is never completely absent and in no case have all of the mid-cauline leaves of plants in this taxon been observed to be strictly sessile, although uncritical observation might tend to lead to the conclusion that they were amplexicaul.

The characters listed below are those that either have been found very useful in the delimitation of species within the vernal group or else they represent characters that serve to define the group. In any case, the procedure of italicizing the phrases applicable to those characters that serve to distinguish the species has been adopted in the specific description as well as emphasizing the more important of these in the discussions that accompany each species treatment.

DURATION.—All of the vernal species of *Helenium* are perennials, and usually quite evidently so. The mode of perennation is by leafy offsets from the caudex. In those plants originating from achenes, the usual course is the formation of a rosette once the plant becomes established following germination. The succeeding season is usually spent in the rosette stage as well. Occasionally some plants will flower in the second season but the more normal and usual course is for the plant to initiate flowering in the spring of the third season. All of the parts

of the plant above-ground are herbaceous, never becoming woody or persisting in an active stage from one season to the next after once flowering. Occasionally there is a secondary flowering period in the same season. Inasmuch as the species of *Helenium*, like other *Compositae*, are determinate in their apical growth, such secondary flowering as does occur is either from buds that have developed in the cauline leaf axils or else from offshoots at the base of the plant that have developed early enough and under conditions sufficiently favorable for their continued growth and maturation.

HABIT.—There are two general classes of growth-habit in the vernal species. *H. pinnatifidum*, *H. vernale* and *H. Drummondii* (*H. fimbriatum* (Michx.) A. Gray) typify the class in which the plants are usually monocephalous and unbranched. Additional heads may develop from cauline leaf axils, but rarely are there more than two of these additional heads. *H. brevifolium*, *H. campestre* and *H. flexuosum* (*H. nudiflorum* Nutt.) are members of the other class in which the plant is normally branched. Within this second class, two forms may be distinguished. *H. brevifolium* and *H. campestre* are oligocephalous with the pedunculate heads arranged in a corymb-like manner. *H. flexuosum* usually has many small heads and the branching pattern is paniculoid. In the species in which the plants have a branched habit, the degree of branching and the number and size of heads is variable to a certain extent under different ecological conditions, becoming more reduced in the relatively unfavorable types of habitats. For the most part, however, the pattern of branching and the inflorescence system, even when more or less variable, are helpful in distinguishing the species.

STEMS.—Aside from the winging of the stems by the leaf bases, there are few instances in which other features of the stem are taxonomically significant. The stems are consistently coarse-grooved or sulcate below and become increasingly finer-grooved or striate above. Frequently the basal portions of the stems are anthocyanaceous but this appears to be correlated with the immediate habitat rather than with any specific or subspecific property.

Ordinarily the stems are essentially glabrous in the basal

regions and for most of the total length, but they are somewhat pubescent to semi-tomentose in the regions of the peduncle and occasionally the leaf axils. In *H. flexuosum*, the scattered pilose hairs on both the stems and leaves, and in *H. campestre* the denser pilosity, are taxonomically significant, however, in the otherwise glabrous-stemmed and glabrous-leaved vernal species of *Helenium*.

LEAVES.—Although there are some significant features about the leaves in relation to particular species, the leaf morphology is not a particularly good specific indicator. Such characters as the shape, size, apex, margin and venation are either so variable as to be totally unreliable and overlap in certain species or else are so uniform as to be relatively useless for taxonomic purposes.

A distinction is made as to whether the radical leaves of some species are petioloid or not. The word petioloid is used to indicate that the leaf bases of the rosette leaves are narrowed to form a petiole-like structure but enlarge again within the rosette so as to become clasping. In no case can a definite distinction be made between that portion of the leaf which is blade and that which is petiole. This character serves as a supplementary distinction between *H. pinnatifidum* on the one hand and *H. vernale* and *H. Drummondii* on the other. It is again used to differentiate *H. brevifolium* from *H. campestre* and *H. flexuosum*. Wherever pertinent in the discussion of the synonymy, leaf characters used in establishing previously segregated taxa are discussed.

RESIN.—Small atoms of resin are a characteristic feature of *Helenium* (as well as of many of the other genera of the HELENIEAE.) These are inconspicuous to the eye, merely imparting a sheen to the vegetative parts, but are very evident at low magnifications. These resin atoms are distributed over all the exterior surfaces of the plant, being on the roots to the least degree and on the floral parts to the greatest degree. In relation to the leaves, there seems to be a correlation between the resin atoms and the impressed-punctations that occur on both the upper and lower surfaces. There is a positive correlation between the resin atoms and the degree of pubescence, in that the more pubescent the plant parts are the less abundant

are the resin atoms. These resin atoms appear to be the causative agent for the sneezing associated with *Helenium*, the "Sneezeweeds." In all probability, the poisoning of sheep and cattle resulting from grazing on *Helenium* and allied genera is related to these resin atoms.

INVOLUCRAL BRACTS.—The involucral bracts are arranged in two distinct series in *Helenium;* the outer series well exceeding the inner. Occasionally, scattered members of a possible third innermost series occur but not consistently enough to be of any taxonomic significance beyond indicating a possible multiseriate ancestral condition. Both of the series are foliaceous in nature, with the number of bracts greater in the outer series. The vernal species reflect the progressive trend (from species-to-species) of a decrease in number with an increase in size of the bracts as is exhibited in other portions of the genus. These trends are so tenuous that little emphasis can be placed on them as taxonomic aids, other than their being noticeable trends within portions of the genus.

The characteristics of the involucral bracts have played an important taxonomic role as a generic distinction of *Helenium.* At least one reviser has considered the "reflexed bracts" of *Helenium* to be the primary distinction between it and the genus *Hymenoxys.* Within the vernal portion of the genus this "distinctive" character proves to have been overstressed and optimistically viewed as a generic character for *Helenium.* In such taxa as *H. pinnatifidum*, *H. vernale* and *H. brevifolium* there is little if any determinate reflexure of the bracts at anthesis. When plants of these three taxa are grown under greenhouse conditions, the involucral bract behaviour is far from uniform. Some plants of these three never exhibit reflexed bracts. During the maturation of the achenes some plants of these three taxa may exhibit a slight amount of reflexure, while other plants unquestionably have reflexed involucral bracts. The total range of behaviour, from never reflexed to undeniably reflexed, has been observed in individual plants of the same collection for all three of the above species. At the other extreme, the involucral bracts of *H. flexuosum* are strongly reflexed at anthesis and remain so throughout the cycle of maturity. Other portions of the genus *Helenium* exhibit this range of involucral bract

behaviour to the extent that very little faith can be put in it as a specific character, much less as a generic one.

RAY FLORETS.—The ray florets provide the most direct character in defining the vernal species-group of *Helenium*. In these vernal species, as previously stated, the ray florets are completely devoid of either stamens or style, in contrast to the styliferous rays of the remaining *Helenium* species. The achenes of these ray florets are abortive and sterile. There has been some doubt expressed in the literature as to the constancy of this feature, as evidenced by the placing of *Helenium flexuosum* in alliance with *H. autumnale* and by the reciprocal consideration that the ray florets of *H. autumnale* (as *H. parviflorum* Nutt.) are at times devoid of styles. In no case has the author observed a specimen of *H. autumnale* to be completely devoid of styliferous ray florets or in a state where a decision between it and the neutral and sterile condition is not immediately possible. Admittedly, some ray florets of some heads in *H. autumnale* may be lacking a style, but the frequency is extremely low. Moreover, such a condition could be expected in the natural variability of any species of the *Compositae* that possesses styliferous ray florets. The fact that the achenes of the ray florets in the non-vernal species of *Helenium* mature at a slower rate than those of the disk is probably responsible for a large part of the doubt cast on the validity of the style character. The fact that the style of the ray florets has no true stigmatic portion probably accounts for the slower rate of maturation of the ray achenes. It is much easier to observe the achene and be influenced by it than it is to determine if the ray floret has a style or not. Similarly, it is possible that some ray florets of the vernal species possess styles although no such specimen was observed. There are a few specimens of *H. autumnale* that superficially resemble *H. flexuosum* (less than 1% of the specimens examined) in features other than the sexual state of the ray corollas. These specimens bear styliferous ray florets, however, and it becomes evident that such "questionable" specimens properly belong to *H. autumnale* when all of the morphological characters are examined. Whether these specimens arose by chance hybridizations of the two species or not, thus providing the basis for the resemblance, has not been settled.

However, it is to be noted that many of the commercial cultivated strains of both *H. autumnale* and *H. flexuosum* are propagated not only because they are thrifty in the garden but also, as a result of color "breaks," because they provide an array of color combinations.

The length of the ray corolla could perhaps provide a quantitative index to the vernal species. The ray corollas of *H. campestre* are noticeably longer than those of the other vernal species and those of *H. flexuosum* are decidedly more cuneate than those of the other vernal species. However, the range of overlap and intergradation, in addition to the fact that most specimens are identified in the dry state after severe shrinkage has occurred, makes the ray corolla only a weak supplementary character for identification at best.

One other character of the ray corollas has served in the past as a basis for segregating taxa. In *H. flexuosum*, particularly in portions of the Texas distribution of the species and to a slight degree in central Florida, the bicolor or completely dark red-brown color of the ray corollas (in contrast to the usually wholly yellow color) is noticeable. However, because duplicate collections show many intergrades between wholly yellow and wholly red-brown and because the same plant can have a mixed assortment of ray colors, little reliance can be placed upon such a character.

DISK FLORETS.—The disk florets provide most of the finer distinctions between the species and traditionally have served to indicate specific limits, with the pappus scales playing a particularly important part.

Corolla.—The shape of the corolla is more or less uniform within the vernal species. While there are differences between the species in the total length of the corolla, the range is between 3–5 mm. for most of the species. In *H. flexuosum* the corolla length is 2–3 mm., the shortest for any of the group. The shape of the corolla is more or less infundibular-campanulate except in *H. flexuosum* where the shape is more campanulate with a more pronounced basal tube. The lobing of the corolla provides a character of taxonomic importance. All of the vernal species except *H. flexuosum* are characterized by a 5-lobed apex. In *H. flexuosum*, however, the number of lobes is

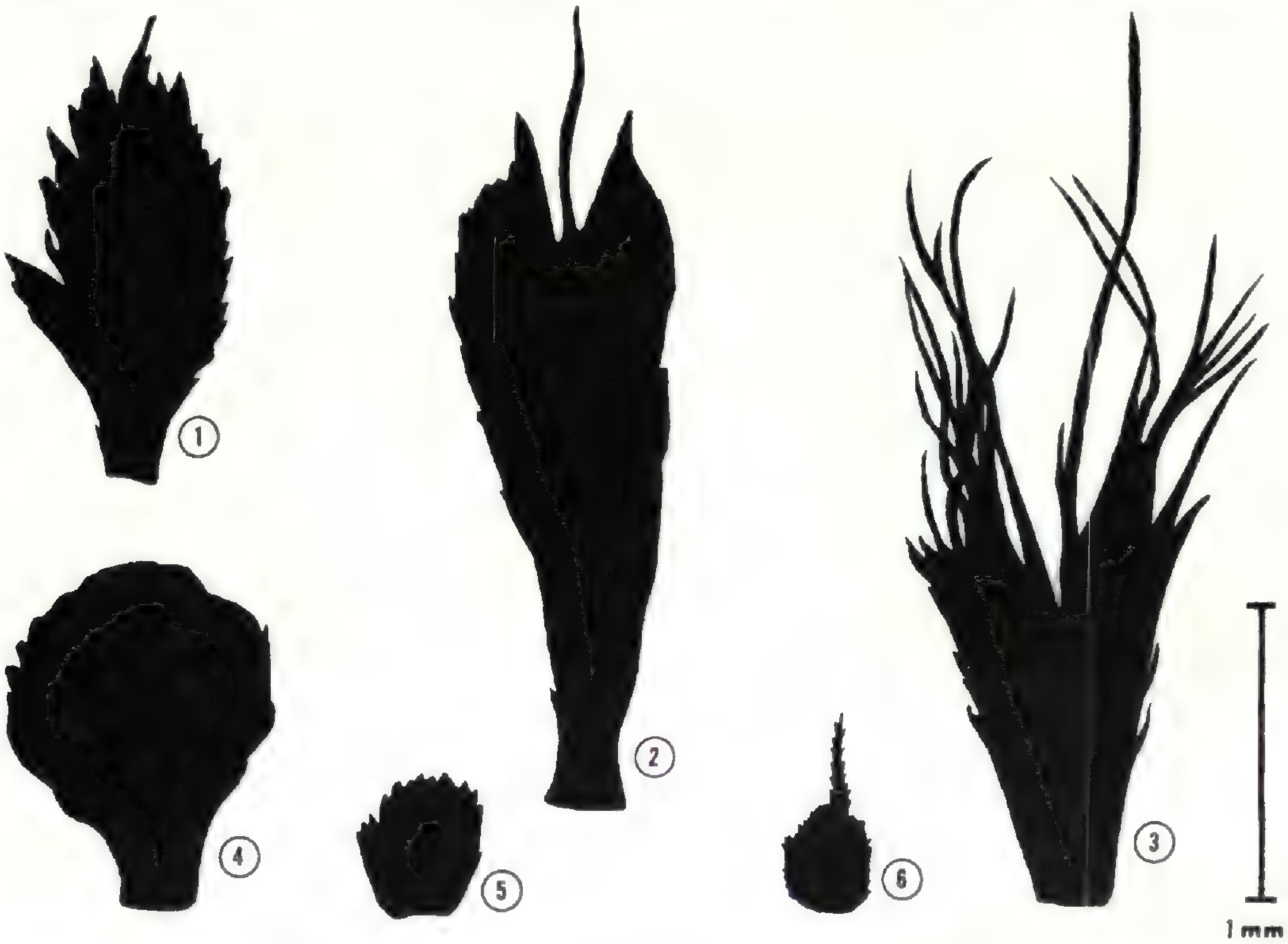
4, rarely 5. This 5- and 4-lobed condition is futher reflected in the anthers. In those taxa with a 5-lobed corolla, the number of anthers is 5 and in *H. flexuosum* the number of anthers is only 4. This quadrimerous condition is indistinguishable from the same kind of condition that prevails in the disk florets of the annual-biennial group of *Helenium*, and the presence of such a character in *H. flexuosum* is taken to indicate a relationship between it and the annual-biennial portion of the genus. The exact cause of this condition is uncertain, but it is undoubtedly derived from the wholesale pentamerous state that prevails in the *Compositae*.

The color of the glandular-pubescent lobes of the corolla often is of taxonomic value. In *H. pinnatifidum*, *H. vernale* and *H. Drummondii*, the yellow disk is a constant and reliable taxonomic character. Similarly, the red-brown color of the disk in *H. brevifolium*, *H. campestre* and *H. flexuosum* reliably indicates these taxa. Occasionally, some specimens of *H. brevifolium* and *H. flexuosum* will have a sordid-yellow disk, rather than red-brown, but such specimens are easily placed on other characters.

Pappus.—As mentioned above, the pappus is probably the most used character in the *Compositae* for specific delimitations. While in this revisional study the character of the pappus is used as a specific criterion wherever it is stable and ranges over a rather narrow limit, no attempt has been made to force it to apply as a criterion in those species where it is relatively inconstant and variable. In practice, pappus characters, such as presence of an awn, midrib, overall length and shape and condition of the margin have been found to apply most frequently to species-groups rather than to particular species. Figures 1–6 present representative pappus scales of the vernal species. It must be emphasized that even though the representations are duplications of actual pappus scales, they merely represent an ideal or stereotype for the species. In only one species, *H. Drummondii*, is the pappus scale so characteristic that it serves as a means to identify the species precisely and immediately. The vernal species of *Helenium*, with the exception of *H. flexuosum*, may be distinguished in a general way from the other species of *Helenium* by the number of pappus

scales per achene. In the vernal species the number of scales ranges from 5 to 10, rarely exceeding 10. The usual range, however, is between 6 and 9. This is in contrast to the nearly uniform prevalence of 5 pappus scales per achene in the other taxa of *Helenium*, including *H. flexuosum* of the vernal species. The anomalous behaviour of *H. flexuosum* in this and the other respects noted throughout the morphological characteristics listed here is more fully discussed in the section on relationships.

Achene.—The lengths of the achenes vary over such a narrow range throughout the vernal species, that no stress can be placed



Figures 1–6. Representative ideodiagrams of pappus scales. Fig. 1. *Helenium pinnatifidum.* Fig. 2. *Helenium vernale.* Fig. 3. *Helenium Drummondii.* Fig. 4. *Helenium brevifolium.* Fig. 5. *Helenium campestre.* Fig. 6. *Helenium flexuosum.*

on the achene length as a taxonomic character. The shapes of the achenes fall into two classes, columnar and truncate-turbinate, but inasmuch as the two classes overlap and the achenial features are not well-expressed until the achenes are mature, very little consideration is made of them. Such characters as the ribbing of the achenes and the 4- to 5-angled shape (which is obscured in the plump and mature achene) are common in the genus. One achenial feature however, is considered to

be of some taxonomic importance; the absence or presence of hairs. *Helenium vernale* is the only vernal species in the genus that is characterized by having glabrous achenes. Such a constant morphological discontinuity, though it is a character normally considered to be minor, is so stable that it must be considered to be significant and allied to the specificity of the taxon itself. In making a comparison between *H. campestre* and the other vernal species with hairy achenes, the distinction between pubescent and puberulent is made. A verbal comparison between these two terms is hardly easier to draw than the differences that prevail in formulating a universally acceptable species concept and so the usual understanding as to the meaning of these terms, pubescent and puberulent, is relied upon. A simple comparison of the two states as they exist in nature is easily made and no difficulty is encountered as to which term adequately describes the differences in the achenial hairs.

Relationships

There has been no published objection to the merger of the former genus *Leptopoda* with *Helenium*. Such diverse taxonomic personalities as Asa Gray, J. K. Small and P. A. Rydberg have consistently upheld the merger in their various treatments involving the genus *Helenium*. Indeed, A. Gray remarked in 1874 (l. c.) that "*Leptopoda* Nutt. is well united to *Helenium*." Moreover, there has never been any really serious attack on the GALARDIAE offered by Nuttall as a natural group of genera. The treatments involving this group of genera have consistently conformed to that outlined by Nuttall. Cassini supported it enthusiastically, and it was followed in a more restrained fashion and perhaps less explicitly by DeCandolle in the *Prodromus*, Bentham in *Genera Plantarum*, A. Gray in both 1874 and in the *Synoptical Flora* of 1884, O. Hoffman in *Die Natürlichen Pflanzenfamilien* (1897) and Rydberg in the *North American Flora*. The exception to this has been, perhaps, the placement of the genus *Balduina* (including *Actinospermum*). In 1884, Gray, following Bentham, placed *Balduina* in the tribe HELIANTHEAE with the provisional notation "(True affinity rather with the *Helenioideae*.)" Subsequent taxonomists have followed Gray's example and have left *Balduina* in the HELIAN-

THEAE, apparently more as a tradition than by conviction, for the logical position of *Balduina* would seem to be with *Gaillardia*, which still resides in the HELENIEAE.

The HELENIEAE, as the group stands today, is generally considered to be an artificial tribe in which the admission requirements are a naked receptacle and an uncertain relationship to other genera firmly established in other tribes. Recently there have been a few attempts to abandon the HELENIEAE as a tribe entirely. Cronquist (Am. Midl. Nat. **53:** 478–511. 1955) went so far as to leave the tribe HELENIEAE out of his "Conspectus of the Tribes of the Compositae," and submerged the helenioid genera in the HELIANTHEAE. The reasons offered for this were essentially two: the artificial nature of the naked receptacle and the polyphyletic nature of the HELENIEAE; and the essentially American distribution of the two tribes, HELIANTHEAE and HELENIEAE, the latter being more strictly so. Such a course of action may seem warranted to some, but the GALARDIAE of Nuttall show sufficient similarity in the style branches, anther bases and vegetative characteristics to the INULEAE that sounder basis than that indicated above would appear to be necessary before the abandonment of the HELENIEAE in favor of the HELIANTHEAE would be acceptable.

The vernal species of *Helenium* form a coherent group of species well-marked from the other species of the genus, though, as would be expected, they resemble in many respects the other members of *Helenium*. The characters that serve to define the vernal species are listed below, in contrast to those of the remaining species of *Helenium*.

Vernal species	*Other species*
1. Ray florets neutral and sterile.	1. Ray florets styliferous and fertile.
2. Pappus scales awnless and obtuse.	2. Pappus scales usually awned and/or acute.
3. Vernal flowering habit.	3. Aestival or autumnal flowering habit.
4. Distribution: southeastern U. S.	4. Distribution: Texas-Mexico, far West or continental.

These characters apply to five of the vernal species in their entirety. *H. flexuosum*, however, while it has neutral and

sterile ray florets, does not conform to the rest of the vernal species in the remaining characters. Morphologically, *H. flexuosum*, apart from the ray character, occupies a position that is intermediate between the vernal species of the southeastern United States and the annual-biennial species of *Helenium* in Texas and Mexico on one hand and the extremely widespread species *H. autumnale*, on the other hand.

(*To be continued*)

LEGUMINOSAE: NOMENCLATURAL NOTES[1]

Duane Isely

Schrankia uncinata Willd. Torrey and Gray (Fl. N. Amer. 400. 1840) took up *Schrankia uncinata* Willd. (Sp. Pl. 4, 2: 1043. 1806) for the leguminous sensitive brier of the central United States and this name was employed by most American authors for nearly 100 years. Standley (Field Mus. Nat. Hist. Bot. 8: 13. 1930) adopted, without discussion, *Schrankia nuttallii* (DC.) Standl. based on *Leptoglottis nuttallii* DC. (Mém. Lég. 451. 1825); *S. uncinata* was relegated to synonymy under *S. microphylla* (Dryand.) Standl.[2] Most recent authors have followed Standley.

Incident to a consideration of the proper epithet for this species, one finds that two more specific names have been used with reference or possible reference to the plant concerned. These four names have been employed in several binomial combinations (*Schrankia, Morongia, Leptoglottis*). Their pertinence to the central states sensitive brier is briefly reviewed below.

Mimosa intsia L. Sp. Pl. 522. 1753. Willdenow (loc. cit.) and subsequently Torrey and Gray (loc. cit.) cited *Mimosa intsia* as employed by Walter (Fl. Car. 252. 1788) as a synonym of *Schrankia uncinata*. Examination of Walter's treatment suggests that he probably had reference to the coastal plain

[1] Journal Paper No. J-3121, Project 1073, Iowa Agricultural Experiment Station, Ames, Iowa.

[2] In making a new combination, Standley apparently overlooked a previous transfer of this epithet to the genus *Schrankia: S. microphylla* (Dryand.) McBride (Contr. Gray Herb. 59: 9. 1919), based on *Mimosa microphylla* Dryand. (In Smith, Geo. Insect. 2: 123. 1797).

species *Schrankia microphylla* (Dryand.) McBride. Furthermore, his name is a misapplication of an earlier Linnaean binomial for an oriental species, which as McBride (op. cit.) has said "indeed bears a superficial resemblance" to *Schrankia microphylla*.

Mimosa horridula Michaux (Fl. Bor. Amer. 2: 254. 1803) has variously been referred to *Schrankia uncinata* or *S. microphylla*. Most recently it was assigned to *S. microphylla* by Merrill (Castanea 13: 69. 1948)—no reason given. McBride (op. cit.) stated that it was not clear from the description whether reference was to *Schrankia uncinata* or *microphylla* and, therefore, the name should be discarded since certain identification seemed impossible. Through kindness of the curator of the Paris Museum, I have been able to borrow the original Michaux sheet.[3] It is *Schrankia microphylla*.

Schrankia uncinata Willd. (loc. cit.) has recently been taken up by Gambill (Leg. Ill. 3. 1953) on the basis that the original description appeared to refer to the species of the north-central states. This interpretation, contrary to the earlier viewpoint expressed by Standley (loc. cit.), is based on the fact that in *S. uncinata* (*nuttalli* of most current authors) the veins on the lower side of the leaflets are raised and distinct; in *S. microphylla*, usually only the midnerve is discernible and it is nearly plane. Willdenow (loc. cit.) referred to the leaflet venation as "subtus elevatovenosis." To definitely ascertain the identity of Willdenow's material, a photograph of the specimen and fragments of the leaflets were recently obtained through cooperation of Dr. D. E. Meyer, Botanischer Garten und Museum, Berlin-Dahlem. The leaflets are plainly nerved; the specimen is our central states *Schrankia*.

DeCandolle's *Leptoglottis nuttallii* (loc. cit.) some 19 years later than *Schrankia uncinata* Willd., contains several ambiguities but probably also refers to this same species. The description relates to a specimen collected by Nuttall in the Arkansas territory which was seen in the herbarium of M. Mercier. This specimen did not possess pods and DeCandolle was uncertain as to whether it should be affiliated with *Desmanthus* or

[3] Photographs of this specimen have been prepared and deposited in the Gray, Chicago Museum, and Iowa State College Herbaria.

Schrankia. He concluded by provisionally describing it as a new genus ("Je le décrirai provisoirement comme un genre particulier"). Then follows a description of the genus *Leptoglottis* moderately definitive for our plant except for the statement "Flores albi" (possibly to be attributed to poor condition of the material).

The proper binomial for this species would appear to be *Schrankia uncinata* Willd.

Author Citation for the Genus Acacia

The genus Acacia is variously attributed to the following authors in current literature: *Acacia* L.; *Acacia* (Tourn.) Mill.; *Acacia* Willd.; *Acacia* Mill.; *Acacia* Adans. In consulting Kew Index one finds *Acacia* (Tourn.) L.

Linnaeus attributes the genus to Tournefort and it is to be found in Tournefort, Institutiones Rei Herbariae 1719 (p. 605 in the written text; table 375 in the illustrations). However, Tournefort and other pre-Linnaean authors may be disregarded for purposes of priority.

Linnaeus did not employ the name *Acacia* in the first edition of Species Plantarum (1753), in the second (1763), or in any of the editions of Genera Plantarum (1737, 1742, 1743, 1752, 1754, and 1764). In both publications the genus is submerged under *Mimosa;* in Genera Plantarum, *Acacia* Tournefort is cited as a synonym of *Mimosa.* Linnaeus, however, used *Acacia* in a generic sense in his Flora Zeylanica 217. 1747, and it is possibly from this treatment that his name is associated with genus. However, since this is prior to 1753, the Linnaean genus *Acacia* has no standing in present nomenclature.

Subsequent to 1753, the name appears to be first employed by Miller (Gard. Dict. Abr. Ed. 4 Vol. 1, 1754). Twenty-four species are enumerated and discussed following a generic diagnosis. Some botanists, however, have referred the genus to subsequent authors (*e.g.* Adanson, Fam. 2: 319. 1763; Willdenow Sp. Pl. 4, 2: 1049. 1806). Perhaps this is because the binomial system of nomenclature is not consistently used in this particular edition of Miller's Handbook. For example, most of the species of *Acacia* discussed are presented as polynomials. However, although the Rules specifically state (Article 79) that specific

and infra-specific epithets are illegitimate when published in works in which the Linnaean system of binary nomenclature for species is not consistently employed, no such requirement is stipulated for generic diagnoses (Article 78). The correct citation would appear to be *Acacia* Mill.—DEPT OF BOTANY, IOWA STATE COLLEGE.

VERNONIA CRINITA IN ILLINOIS.—Recording the occurrence of this species of Compositae seems desirable, as it has not been previously reported to have been found growing in Illinois, and the few plants that are known to occur here will soon be exterminated. In the Herbarium of the University of Illinois there are the following two collections from eastern Illinois. CHAMPAIGN CO.: at edge of road west of Champaign about a quarter of a mile south of the Champaign Airport, August 3, 1955, *J. P. Slimmer 111* (plants immature); September 18, 1955, *G. N. Jones 20598* (plants in full flower).

Both collections were made at the same place. There are about a dozen plants on a narrow roadside strip of prairie bordering a field. Here they appear to be making their last stand. These plants are almost certainly native. That they might have been planted in that place is out of the question, and there is no sign that they are adventive. The nearest known native occurrence of this species is in central and southern Missouri (Palmer & Steyermark, 1935, Ann. Mo. Bot. Gard. **22:** 654), more than two hundred miles southwest of Champaign County, Illinois. The range of the species includes Kansas, Oklahoma, and Arkansas, although Gray's Manual, where the species is described and well illustrated, reports it as adventive in Ohio.—GEORGE NEVILLE JONES, UNIVERSITY OF ILLINOIS.

A NEW AMELANCHIER OF EASTERN CANADA

FATHER LOUIS-M. LALONDE

THERE is no doubt that M. L. Fernald's statement in RHODORA[1] that "no genus of the Rosaceae in North America, except of course *Rubus* and *Crataegus*, has offered so much perplexity and has had such contradictory treatment as *Amelanchier*"

[1] Fernald, M. L.—A Monograph of Amelanchier. RHODORA **48**: 129–134, 1946.

is still painfully true, especially for the material collected in the Province of Québec. The herbarium specimens of Ernest Lepage, from northeastern Québec (mainly from Rimouski and the counties of Gaspé Peninsula), recently sent to American specialists came back with question marks on nearly 25 per cent of the revision labels, also with a few hybrid marks! The material in our Oka Institute herbarium, mainly from southwestern Québec, checked by Wiegand and Fernald, also carries marks of "perplexity", as in this note: "Find this 3693 difficult to name at this stage as it seems unlike any species that ought to be found in that region. Would like to see more mature material also. . . Are there many individuals all alike? . . ." —Just to mention one of our interesting problems, there are in or quite close to the Oka Pine Barren, described elsewhere,[2] half a dozen species of *Amelanchier;* among them that Wiegandian pair of "common and widespread small serviceberry" *humilis* and *stolonifera*—dominant and characteristic in this rapidly disintegrating formation as far as *Pinus Strobus* is concerned.— But here the trouble starts, for, while our *A. stolonifera* is oxylophytic and follows correctly the description in the manuals, being 3–12 dm. high, stoloniferous in loose colonies, its leaves of the right shape with sharp teeth running much below the middle, our *A. humilis,* incorrectly enough is not calcicolous, growing with *Kalmia, Arctostaphylos, Gaultheria, Gaylussacia* and *Vaccinium.* Erect and fastigiate, often 6 to 8 ft. high, with very truncate, coarse toothed, oval-oblong to orbicular, dull dark green leaves, this plant looks quite like Lamarck's *A. spicata,* as photographed by B. G. Schubert, after Alfred Rehder (Rhodora **48:** plate 1027, 1946), and after all probably brought two centuries ago from Canada. Surely it looks like Prof. G. N. Jones' *A. spicata!* By its leaves, this species seems also near to the western *A. alnifolia* Nutt. (w. Ontario to Yuk., s. to nw. Ia., Nebr., Colo. and Oregon), but its raceme here is ten-flowered.[3]

[2] Louis-Marie, P.—Parallèle entre les pinèdes du New Jersey et celles du Québec. Revue d'Oka **27** (6): 159–165, 1953.—La structure de la végétation d'Oka, P. Q., Canada. Rev. d'Oka **27** (2): 29–40, 1953.

[3] What ever comes out of this Oka *A. humilis,* (fide Wiegand and Fernald), it would not be surprising if the living Amelanchier transplanted in Paris, dans le Jardin du Roi, coming from Nouvelle-France of the XVIII century, had not been unrooted from this long Pine-barren along the northern side of the Two-mountain Lake, only a few miles distant from Ville-Marie (Montreal), just facing the western end of Montreal Island where stood a military fort and a trading post.

PLATE 1228. Type sheet of *Amelanchier Quinti-Martii.*

In southern Québec too, several apparently new types have been collected and, after years of observation in the field, are now being studied seriously by young Amelanchierist of this Province, Lionel Cinq-Mars for whom I name the following new species, initially labeled *A.* × *Bartramiana*, found by him in the region of Rougemont (Rouville County).

Amelanchier Quinti-Martii Lalonde, sp. nov.—Frutex vagans, stoloniferus, 1–3 m. altus.—Gemmae terminales 6–8 mm. long., 2.5 mm. lat., perulae squamis rubro-fuscis, viriditinctis in margine pilosisque prope basin, inferioribus squamis tridentatis.—Folia, cum conduplicata prefoliatione, semi-evoluta per anthesim sparseque pilosa; novae laminae plus minusve aeneae et adhuc cum raris pilis superius, inferius dense sericeo-pubescentes; maturae laminae firmae et luridae, glabrae superius, paulo griseae inferius cum pilis in nervo mediano; petioli pubescentes, 5–10 mm. long.; laminae rami floriferi ovatae, raro ellipticae vel obovatae, breviores in ramis sterilibus, 2–3.5 cm. × 3–4.5 cm. long., apice breve acuminatae, basi rotundatae vel acutae, argute et oblique serratae, cum 5–12 dentibus per cm., usque sub medio vel usque ad basim; ad venis primariis 7–12-jugis, irregularibus et ad marginem reticulatis.—Flores 2–3, cymose insertae, pedicellis pubescentibus etiam in fructu, 15–25 mm. long.; petalis elliptico-obovatis, 9–13 mm. long., 5–6 mm. lat.; sepalis triangulis et longe acutis, laxe reflexis; hypanthio 3–6 mm. diam., crateriformi, glabro intus et tomentoso exterius; summo ovario potius convexo denseque lanato.—Fructus fere caeruleus, globosus, adhuc sparse pubescens, 10–15 mm. long., 8–12 mm. diam.; sepalis rubris, utroque pilosis, erectis vel revolutis; ad maturitatem farinosus et insipidus.

Bushy shrub 1–3 m. high, stems solitary or few together, spreading by subterranean offsets. Terminal buds 6–8 mm. long, 2.5 mm. wide; lateral buds smaller; the center of buds' scales reddish brown, margins paler with a green tinge and hairs exserting from below, even on the lower scales; lower scales broadly 3-toothed, the two outer teeth sharper; no conspicuous veins on the scales. Leaves folded or conduplicate in bud, halfgrown at flowering time, remaining folded for some time after emerging; sparsely pilose, deep green and somewhat bronze on upper surface when young, densely silky-pubescent on lower surface; bronze brownish color of leaves very conspicuous during and sometime after anthesis; mature leaves thick, lustrous, and glabrous on upper side, grayish and with few hairs mostly along the midrib on the lower side; petioles permanently pubescent, 5–10 mm. long; mature blades on fertile branchlets ovate, elliptic to obovate, those on sterile branchlets more rounded or short acute, 2–3.5 cm. × 3–4.5 cm. long; apex rounded to short acuminate; base rounded to short acute; margin sharply serrate to below the middle or nearly to the base; teeth usually abruptly and obliquely sharp acuminate from a broad base, 5–12 teeth per cm.; sinuses of the teeth sharp; primary lateral veins very prominent and conspicuous on both sides of the leaves, 8–12 on each side of the midrib, irregularly distant with occasionally short intermediary veins, anastomosing and

indistinct in the outer third of the leaf blade. Inflorescence cymose or with 2-3 terminal flowers. Pedicels very pubescent at flowering time, less so when the fruit is ripe, 15–25 mm. long. Petals elliptic to obovate, 9–13 mm. long, 5–6 mm. broad. Sepals triangular long acute, sometime with subulate tips, loosely spreading, 3–4 mm. long; persistently tomentose on both sides. Hypanthium 3–6 mm. in diameter, cup-shaped or deeply saucer-shaped, glabrous inside, copiously tomentose outside; ovary summit densely woolly; base of the style abruptly inserted on the rounded or somewhat flattened summit of the ovary. Fruit blue, globose and plump, retaining some pubescence on its surface, 10–15 mm. long, 8–12 mm. in diameter, with the hairy sepals reddish or pale in color, erect or irregularly revolute; mealy and rather tasteless when ripe.

This new taxon is intermediate between *A. Bartramiana* Wieg. and *A. arborea* (Michx. f.) Fern. and was found at Rougemont, Rouville County, Québec (lat. 45° 25′, long. 73°) in partly dry bog, woods and thickets, with *Viburnum cassinoides*, *Pyrus melanocarpa*, *Betula populifolia*, *Pinus Strobus* and the bog Ericaceae.—Type: *Lionel Cinq-Mars 11;* in flower, May 9, 1955, fruct. July 4, 1955. Type in the Ottawa Central Experimental Farm herbarium. All the typical material distributed under No. 11 in flower or in fruit, was collected on the same plant in 1955. Since then, this species has been found in the same kind of habitat at three other stations in Rouville County and in the Sherbrooke area some 70 miles away.

A. Quinti-Martii, intermediate between *A. Bartramiana* and *A. arborea*, differs sharply from both in the following characters:

A. Bartramiana	*A. Quinti-Martii*	*A. arborea*
Cespitose, fastigiate slender shrub; 0.5–2.5 m. high.	Stems solitary or few together from subterranean offsets; 1–3 m. high.	Fastigiate, solitary or few together; 5–20 m. high.
Young leaves light green and glabrous.	Deep brownish green, not glabrous.	Green not brownish, nor glabrous.
Petiole short, 2–7 mm. glabrous or glabrescent.	Permanently pubescent, 5–15 mm. long.	Pubescent when young, longer than 15 mm.
Inflorescence, cymose with 2–3 terminal flowers.	Cymose, 2–3 flowers.	Raceme 3–5 cm. long, nodding.
Petals 6–9 mm. long.	Petals 9–13 mm. long.	Petals 10–14 mm. long.
Style divided to its base or nearly so.	Divided to ½ of its length.	Divided very little, about 1/6 of its length.
Ovary summit conical and woolly.	Somewhat rounded and woolly.	Almost flat and glabrous.

—INSTITUT D'OKA, UNIV. DE MONTREAL.

NOTES ON ILLINOIS GRASSES

John W. Thieret and Robert A. Evers

The following records and data have been accumulated during 1956. Specimens cited (F) are in the herbarium of the Chicago Natural History Museum; those cited (ILLS) are in the herbarium of the Illinois State Natural History Survey at Urbana.

1. ADDITIONS TO THE GRASS FLORA OF ILLINOIS

Agropyron desertorum (Fisch.) Schult. (determination verified by Dr. Jason R. Swallen). This wheatgrass was collected in the Milwaukee Road classification yard at Bensenville, Cook County, Illinois, August 9, 1956, *Thieret 2295* (F, ILLS).

2. ADDITIONS TO THE GRASS FLORA OF THE CHICAGO REGION

Distichlis stricta (Torr.) Rydb. Two thriving colonies of desert salt-grass—a species collected but once previously in Illinois, near Urbana—were found in the Milwaukee Road classification yard at Bensenville, Cook County, Illinois, August 8, 1956, *Thieret 2232* (F, ILLS).

Aegilops cylindrica Host. Goat grass was collected in the Milwaukee Road classification yard at Bensenville, Cook County, Illinois, August 9, 1956, *Thieret 2294* (F, ILLS).

3. MISCELLANEOUS NOTES

Erianthus ravennae (L.) Beauv. On the basis of a single collection, this cultivated ornamental grass is reported by Jones and Fuller (Vascular Plants of Illinois. Ill. State Mus. Sci. Ser., vol. 6, 1955) as spontaneous in Illinois. The following additional collections have been made near Chester, where the species shows a definite tendency to become naturalized: spontaneous (according to nearby homeowner) in road right-of-way along route 3, 0.7 mile north of north edge of Chester, Randolph County, Illinois, September 26, 1956, *Thieret 2778* (F);—spontaneous in road right-of-way along route 3, 2.1 miles north of north edge of Chester, September 27, 1956, *Thieret 2783* (F);—spontaneous according to local housewife, at least 50 flowering stalks, about 15 clumps, colony along route 150 at edge of field opposite house number 1705, east of junction of routes 3 and 150, Chester, September 27, 1956, *Thieret 2784* (F).

Agropyron dasystachyum (Hook.) Scribn. In Mosher's The Grasses of Illinois (Univ. of Ill., Agr. Exp. Sta. Bull. 205. 1918.) and in Jones and Fuller (op. cit.), this species is attributed to Illinois on the basis of the following collection: C. & N. W. R. R., west of Turner, Du Page County, Illinois, *W. S. Moffatt 231*, June 26, 1897 (F; also Univ. of Ill. Herb.). Thickspike wheatgrass is also attributed to Illinois in Hitchcock-Chase (Manual of the Grasses of the United States. USDA Misc. Publ. 200. 1950.), presumably on the basis of the Illinois specimen labelled *Agropyron dasystachyum* in the herbarium of the United States National Museum: on ballast, West Chicago, Illinois, June 26, 1897, *L. M. Umbach, no number* (also in F). Both the Moffatt and Umbach collections are better referred to *Agropyron smithii* Rydb. var. *molle* (Scribn. & Smith) Jones, a taxon not cited in Jones and

Fuller (*op. cit.*) and one that cannot be "keyed out" in Fernald (Gray's Manual of Botany, 8th ed. New York, 1950). There are no authentic Illinois specimens of *Agropyron dasystachyum* in the herbarium of the Chicago Natural History Museum, of the Illinois State Natural History Survey, of the United States National Museum, of the University of Illinois, of the Missouri Botanical Garden, or in that of the University of Wisconsin. Therefore, until this species is actually collected in Illinois, it must be excluded from the state flora.

The following data for culm height of several taxa are given because they exceed by a considerable margin the maximum height given for these in Hitchcock-Chase (*op. cit.*) and/or in Fernald (*op. cit.*).

Andropogon gerardi Vitman.—Evers found and measured culms 3.0 meters tall from a rolling prairie remnant, about seven miles south of Camp Point, Adams County, Illinois, September 14, 1956. This site, which had not been cultivated for a quarter of a century, has reverted to a type of big bluestem prairie. It has been accidently burned on several occasions. It is pastured in early summer, but the cattle shun the tall grass by late summer and autumn. (Hitchcock-Chase, 2 m.; Fernald, 1.5 m.).

Erianthus ravennae (L.) Beauv., 4.57 m., *Thieret 2777* (F), lawn specimen, Chester, Randolph County, Illinois. (Hitchcock-Chase 4 m.; Fernald 3 m.).

Sorghum vulgare var. **drummondii** (Nees) Hask. ex Chiov.—Plants of this sorghum were growing in a cornfield along the banks of the Ohio River at Backus Landing, east of Grand Chain, Pulaski County, Illinois, September 11, 1956. The plants were as tall as, or taller than, the corn (*Zea mays* L.) in the field. Measurements made by Evers showed the plants to be 3.1 m. tall. (Hitchcock-Chase, 2 m.).

Spartina pectinata Link.—Prairie cord grass grows quite tall in suitable sites in Illinois. A photograph in the Illinois Natural History Survey Bulletin 13 (16): Pl. L., 1921, shows this grass as high as a buggy top, the vehicle needed by the botanist at that time in that section of the state when the roads were poor. On October 3, 1956, Mr. Hugh Cunningham, a member of the Survey staff, brought in a culm of prairie cord grass that measured 3.3 m. tall. This sample was collected along the Illinois Central R. R. south of Champaign, Champaign County. (Hitchcock-Chase and Fernald, 2 m.).—CHICAGO NATURAL HISTORY MUSEUM AND ILLINOIS STATE NATURAL HISTORY SURVEY.

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CONTRIBUTIONS TO THE FLORA OF SOUTHERN ILLINOIS

Robert H. Mohlenbrock and John W. Voigt

This paper is a further report on the progress of studies made on the distribution of vascular plants in the southern counties of Illinois.

Work in the field and the herbarium of Southern Illinois University during the summer of 1955 uncovered eight plants previously unreported for Illinois and numerous additional locality records for some of the rarer species. Twelve of the latter are enumerated below, along with the additions to the Illinois flora.

All specimens cited are deposited in the herbarium of Southern Illinois University.

SPECIES NEW TO ILLINOIS

Glyceria pallida (Torr.) Trin. This species may be added to the Illinois flora as it occurs in shallow water in the LaRue Swamp. According to Mosher (1918), specimens in the herbarium of the University of Illinois labelled *G. pallida* actually belong to the genus *Poa*. COLLECTION DATA: shallow water, LaRue Swamp, Union County, June 6, 1952, *Bailey and Swayne 2485*.

Hystrix patula Moench var. **bigeloviana** (Fern.) Deam. This variety of the Bottlebrush-grass with pubescent lemmas was found in a calcareous woods where it was much more abundant than the typical variety. COLLECTION DATA: woods at base of limestone cliffs, one mile north of the Pine Hills, Jackson County, July 5, 1955, *Mohlenbrock and Stewart 5466*.

Elymus interruptus Buckl., which is a rather poorly understood species with a peculiarly disjunct distribution in the United States, has been found for the first time in Illinois. It occurs in rich moist soil along the edges of woods. COLLECTION DATA: Little Grand Canyon, Jackson County, June 21, 1951, *Voigt 877;* Pine Hills, Union County, October, 1955, *Voigt 1311.*

Carex oxylepis Torr. & Hook. was collected in a low swampy cypress woods. It is known from Butler and Dunklin Counties in southeastern Missouri (Palmer and Steyermark, 1935). Several species of *Carex* occur in this woods including *C. grayii* var. *hispidula, C. muskingumensis,* and *C. louisianica.* COLLECTION DATA: swampy woods east of Dongola, Union County, July 11, 1955, *Voigt and Mohlenbrock 5553.*

Chenopodium polyspermum L. Collections in freight yards often produce rare and interesting adventive species. One such waif found growing in cinders along the railroad is the Many-seeded Goosefoot. It has been reported from Hancock County, Illinois (Kibbe, 1952) but no specimens have been seen. COLLECTION DATA: in cinders along GMO railroad, Murphysboro, Jackson County, June 18, 1955, *Mohlenbrock 5420A.*

Draba cuneifolia Nutt. ex Torr. & Gray. This small crucifer has been attributed to Illinois several times but, according to Jones (1955), the occurrence of it in the state seems to be based on a statement by Patterson (1876), "Credited to Illinois in Gray's Manual," and a statement by Higley and Raddin (1891), "Chicago, April 1875, *Babcock.* Probably a waif." No authentic specimens for Illinois have been cited by any previous author. However, *Draba cuneifolia* has been found in limestone talus in Monroe County. COLLECTION DATA: one mile south of Fults, T4S, R10W, section 36, Monroe County, April 21, 1952, *Bailey and Swayne 2077.*

Prunus mexicana S. Wats. The Big-tree Plum is listed in the New Britton and Brown Flora (Gleason, 1952) from southern Missouri to Texas while the Eighth Edition of Gray's Manual (Fernald, 1950) does not mention this species. A specimen about twenty feet tall was found growing in talus at the base of a massive limestone bluff. COLLECTION DATA: base of limestone bluff, one mile north of the Pine Hills, Jackson County, July 5, 1955, *Mohlenbrock and Stewart 5468.*

Rubus enslenii Tratt. is recorded by Fernald (1950) only as far west as Indiana. However, it occurs along a rocky stream in Randolph County in southwestern Illinois. COLLECTION DATA: along Piney Creek, Randolph County, May 22, 1954, *Mohlenbrock and Voigt 2470.*

ADDITIONAL LOCALITIES FOR RARE SOUTHERN ILLINOIS SPECIES

Isoetes melanopoda Gay and Dur. was found growing in great abundance in a roadside ditch in Jackson County. The station is under water for a portion of each year. Some of the specimens were exceedingly robust and one was found to have 80 leaves. A few pale-based specimens which may be segregated as forma *pallida* (Engelm.) Fern. occur with the species. The nearest known station of *I. melanopoda* to the Jackson County one is in St. Clair County, about 100 miles to the north (Neill, 1950). COLLECTION DATA: (typical), along Route 3, two miles south of Junction of Routes 3 and 144, Jackson County, June 13, 1955, *Mohlenbrock 5385:* (forma *pallida*), *Mohlenbrock 5386.*

Ophioglossum engelmanni Prantl. The occurrence of this species of Adder's-tongue in Randolph County marks the third known station for it in Illinois. The others are in Hardin County, 120 miles to the southeast, and Jersey County, 100 miles to the north. In Randolph County, the species occurs in thin soil under *Juniperus virginiana* on high limestone bluffs on the Menard prison grounds. It is very abundant at this site. COLLECTION DATA: limestone bluffs, Illinois State Penitentiary, Menard, Randolph County, June 21, 1955, *Mohlenbrock and Voigt.*

Asplenium bradleyi D. C. Eaton. The rare Bradley's Spleenwort, first collected in Illinois in 1954 (Mohlenbrock, 1954) from Randolph County and later from Jackson County (Mohlenbrock, 1955) has been found in a deep shaded sandstone ravine at Panther's Den in Williamson County. COLLECTION DATA: Panther's Den, Williamson County, July 12, 1955, *Bollwinkel and Voigt 1312.*

Bouteloua curtipendula (Michx.) Torr. Although Side-oats Grama is rather common in northern Illinois and on the hill prairies along the Mississippi River in western Illinois, the collection from Hardin County represents the first of this species from southeastern Illinois. It occurs on limestone bluffs overlooking the Ohio River at Cave-in-Rock. COLLECTION DATA: limestone bluffs, Cave-in-Rock State Park, Hardin County, August 10, 1955, *Mohlenbrock 5593.*

Carex intumescens Rudge is a robust sedge which resembles the typical-variety of *Carex grayii.* It has been collected in low woods in southern Illinois and was known previously in Illinois from Cook and Peoria Counties, but had not been collected since 1908. COLLECTION DATA: northeast of Karnak, Illinois, Johnson County, May 30, 1952, *Bailey and Swayne 2457.*

Carex oligocarpa Schk. ex Willd., which is extremely rare in southern Illinois, was collected in a calcareous woods near the base of a massive limestone cliff. COLLECTION DATA: one mile north of the Pine Hills, Jackson County, July 5, 1955, *Mohlenbrock and Stewart 5467.*

Carex decomposita Muhl. The Cypress-knee Sedge, known previously in Illinois only from the LaRue Swamp in Union County, has been collected in a cypress-tupelo gum swamp in Pulaski County where it grows on rotting wood. COLLECTION DATA: swamp, 1½ miles west of Pulaski, Pulaski County, July 2, 1955, *Voigt 1805.*

Spiranthes ovalis Lindl. The discovery of this species in Union County brings to four the number of known stations for it in Illinois. It is apparently rare throughout its entire range. Our specimen was growing in a calcareous woodland ravine between limestone bluffs. Only one plant was found. COLLECTION DATA: Pine Hills, Union County, October, 1955, *Mohlenbrock 5762.*

Descurainia sophia (L.) Webb. This adventive mustard, while occurring sparingly in northern Illinois, was unknown south of Champaign County until it was recently discovered along a railroad in Jefferson County by Mr. Joe Garrison. COLLECTION DATA: along railroad, Mt. Vernon, Jefferson County, May 28, 1955, *J. Garrison.*

Cardiospermum halicacabum L. The discovery of the very interesting Balloon vine in Jackson County marks the second occurrence of it in Illinois. It grows on scrubby shrubs in a frequently inundated floodplain along the Mississippi River. COLLECTION DATA: near Neunert, Jackson County, *Brewer.*

Fraxinus quadrangulata Michx. The Blue Ash was collected on a steep limestone bluff in southwestern Jackson County. This makes the second collection for it in southern Illinois, the other having been made in Union County. COLLECTION DATA: one mile north of the Pine Hills, Jackson County, July 5, 1955, *Mohlenbrock and Stewart 5462.*

Kickxia elatine (L.) Dumort. The Canker-root is another of the railroad waifs recently found in southern Illinois. It was previously known from four central and northern counties. COLLECTION DATA: along GMO railroad, Murphysboro, Jackson County, June 18, 1955, *Mohlenbrock 5419.*—
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A REVISION OF THE VERNAL SPECIES OF HELENIUM (COMPOSITAE)

HOWARD F. L. ROCK

(*Continued from page 116*)

The author has deliberately refrained from referring to the vernal species of *Helenium* throughout the earlier portion of this paper in any formal subgeneric sense in order to make his position clear at this point. Ordinarily, the vernal species of *Helenium* conform to at least a subgenus in *Helenium*, if one were to follow the concepts that prevail in the *Compositae* today. However, inasmuch as this revision was conducted primarily on the basis of herbarium specimens and the data they provide, and to a lesser extent on field studies, any change in the formal subgeneric classification of *Helenium* from that

which prevails in the *Synoptical Flora* and *Die Natürlichen Pflanzenfamilien* does not seem warranted at this time. Until data can be accumulated from sources other than those used up to the present and judged in relation to similar kinds of data for the other portions of the genus *Helenium*, the conservative expedient of maintaining the subgeneric *status quo* seems advisable. Therefore, following Gray and Hoffmann for the present, the various morphological species-groups that exist in *Helenium* are recognized here as Sections.

Provided below is a synopsis of the sections of *Helenium* and those genera allied to it, the GALARDIAE of Nuttall:

SYNOPSIS OF THE SECTIONS OF HELENIUM AND ALLIED GENERA

A. Receptacle appendaged; the appendages being either in the form of indurated subulate setae, occurring in the interstices between the achenes or else as pentagonal or hexagonal indurated cupules surrounding the achenes, but in neither case paleaceous in form.
  B. Appendages setiform. . . . . *Gaillardia.*
  B. Appendages cupuliform.
    C. Pappus scales lanceolate to elliptic-lanceolate in outline, the apices acute . . . . *Balduina.*
    C. Pappus scales suborbicular to reniform in outline, the apices obtuse . . . . *Actinospermum.*
A. Receptacle naked, i.e. without definite appendages, the surface denticulate at the most.
  D. Style branches appendaged; the filiform and hispidulous appendage extending from the penicillate portion of the style branch which terminates the stigmatic portion . . . . *Gaillardia.*
  D. Style branches unappendaged, the apices truncate and penicillate.
    E. Cauline leaf bases (at least those of the midcauline leaves) decurrent along the stem forming wings on the stem.
      F. Pubescence of the involucre red-black
        Helenium Section HECUBAEA
      F. Pubescence of the involucre colorless to tawny or involucre glabrous.
        G. Ray florets lacking.
          H. Plants perennial with a short, fibrous-rooted caudex; perennation by leafy offsets; disk color red-brown; central Florida and eastern Texas
            Helenium flexuosum (Section LEPTOPODA).

H. Plants annual-biennial with a coarse tap-root; leafy offsets usually absent; disk red-brown, rose-purple, blue-purple or yellow.

I. Plants of western Texas, Mexico, Arizona and Baja California Sur *Helenium* Section TETRODUS.

I. Plants of coastal southern California and Baja California del Norte............*Helenium* Section HELENIUM.

G. Ray florets present.

J. Ray florets neutral, their achenes abortive................*Helenium* Section LEPTOPODA.

J. Ray florets styliferous, their achenes fertile, though slow-maturing.

K. Plants annual-biennials, usually with numerous heads on short peduncles and the heads relatively small; disk florets predominantly quadrimerous......*Helenium* Section TETRODUS.

K. Plants perennial, heads relatively large and on elongate peduncles; disk florets predominantly pentamerous.........*Helenium* Section HELENIUM.

E. Cauline leaf bases not decurrent along the stem and the stem not winged.

L. Inner involucral bracts distinctly scarious and pappus-like, in contrast to the foliaceous outer bracts; disk corolla lobes glabrous; achenes with gross, corky, densely hispid ribs; dried plants with a *Melilotus*-like odor............*Amblyolepis.* (Section AMBLYOLEPIS in Hoffmann)

L. Inner involucral bracts not markedly different in quality from the outer bracts; disk corolla lobes glandular-pubescent; ribs of the achenes not distinctly gross or corky in relation to the body-proper of the achene; dried plants without a *Melilotus*-like odor.

M. Ray corollas oblong to barely oblong-cuneate in shape, usually many times longer than wide; outer involucral bracts not distinctly reflexed at maturity, often becoming indurated at the base with maturity; inner involucral bracts equal to or exceeding the outer series, or if the inner series is subequal to the outer series, then the involucral base tomentose..........

Helenium Section OXYLEPIS. *Hymenoxys* (incl. *Tetraneuris*, *Rydbergia*, *Actinella*, *MacDougalia*)

M. Ray corollas distinctly and broadly deltoid-cuneate; involucral bracts decidedly reflexed at maturity; the inner series of involucral bracts shorter than the outer series and the involucral base not tomentose. *Helenium* Section HELENIUM. (*Helenium amarum*[1] and *Helenium badium*)

Infrasectional Relationships

MORPHOLOGICAL CONSIDERATIONS

The six species of the Section LEPTOPODA may be easily placed into two categories on the basis of external form and aspect, and the shape of the pappus scales. These two subgroups and the species included in them are:

A. Monocephalous; unbranched; yellow disk color; pappus elliptic-lanceolate to elliptic-oblanceolate, obtuse and unawned.

1. *Helenium pinnatifidum*
2. *Helenium vernale*
3. *Helenium Drummondii*

B. Oligo- or polycephalous; branched; red-brown disk color; pappus obovate to suborbicular, obtuse and unawned or else lanceolate-acuminate and awned.

[1] There is no doubt in the author's mind that the plant designated by Rafinesque as *Galardia amara* (Fl. Ludov. 69. 1817) is identical to Nuttall's later *Helenium tenuifolium* (Jour. Acad. Sci. Phil. 7: 66. 1834.) Rafinesque's description is quoted below:

217. *Galardia amara* Raf. Caule apice paniculate, ramis unifloris, foliis linearibus reflexis glabris, ligulis apice dilatatis tridentatis Raf.—Anthemis Robin p. 440. This plant has not the habit of *Anthemis*, but rather of a *Galardia;* as Robin describes it imperfectly, it may, however, be either, or even an *Helenium.* Stem rising about one foot and a half, round and smooth, with many long leaves of deep green. Perianth [involucre] small embricated with unequal leafy folioles, rays much longer, phoranth [receptacle] spherical (seeds perhaps naked). The whole plant is odoriferous and intensely bitter, it gives an abominable bitter taste to the milk of the cows that feed on it in summer, when the plant thrives and keeps green notwithstanding the greatest drought. It grows at Atakapas [Mississippi] near roads and houses but was brought there accidentally.

Therefore, the following new combination is proposed to reinstate the prior specific epithet proposed by Rafinesque:

Helenium amarum (Raf.) H. Rock comb. nov.
Galardia amara Raf. Fl. Ludov. 69. 1817.
Helenium tenuifolium Nutt. Jour. Acad. Sci. Phil. 7: 66. 1834.

NEOTYPE: Collected by C. R. Ball, no. 182, 6 Sept. 1898 at Alexandria, Rapides Parish, Louisiana (US-364605).

4. *Helenium brevifolium*
5. *Helenium campestre*
6. *Helenium flexuosum.*

On the basis of the above characters and a series of characters that have been judged to have a "primitive" or "advanced" standing within the genus *Helenium* listed below, a scheme reflecting the evolution that has occurred within and between these two subgroups seems possible. The term "subgroup" is used here only for purposes of discussion. It is not used as a formal taxonomic category within the section LEPTOPODA.

PRIMITIVE	ADVANCED
1. Perennial habit	1. Annual-biennial habit
2. Vernal flowering	2. Aestival or autumnal flowering
3. Leaves non-decurrent	3. Leaves decurrent
4. Monocephalous, unbranched	4. Polycephalous, branched
5. Heads large, long-pedunculate	5. Heads small, short-pedunculate
6. Involucral bracts short, broad, numerous, non-reflexed	6. Involucral bracts long, narrow, fewer, reflexed
7. Receptacle broad, convex	7. Receptacle narrow, conical
8. Heads radiate, rays styliferous	8. Heads discoid or rays neutral
9. Rays homochromatic and yellow	9. Rays heterochromatic, yellow and/or red
10. Disk yellow	10. Disk red-brown, rose-purple or blue-purple
11 Disk florets pentamerous	11. Disk florets quadrimerous
12. Pappus present, more than 5-membered, scales large, awnless, more or less entire-margined	12. Pappus absent or pappus 5-membered, scales reduced in size, awned, margin more or less distinctly modified
13. Achenes pubescent	13. Achenes glabrous
14. Distribution restricted, plants of mesic habitats	14. Distribution wide-spread, plants of varied habitats, increasingly more xeric
15. Plants of coastal, humid, southerly areas	15. Plants of upland, drier, northerly areas

Helenium pinnatifidum is considered to be the least specialized or the most primitive species within the section LEPTOPODA. In addition to the characters given for the first subgroup (which is interpreted as the more primitive subgroup), two leaf characters exhibited by *H. pinnatifidum* are interpreted as being primitive within the section. First, only the mid-cauline leaves are decurrent along the stem, with the wings so formed not exceeding

5 mm. in extent. Secondly, the radical leaves of *H. pinnatifidum* do not taper so as to form a petioloid structure, but instead, are inserted on the stem within the rosette without a pronounced basal constriction.

Along with these leaf characters, *H. pinnatifidum* has decidedly pubescent peduncles and involucral bases. Moreover, the achenes are hairy-pubescent. These characters of pubescence are interpreted as ancestral to the glabrous condition of the peduncles, involucral bases and achenes encountered in one of the other species of the section LEPTOPODA. The smaller size of the pappus scales of *H. pinnatifidum* is in direct contrast, however, to the presumed primitive and ancestral position of *H. pinnatifidum*, a large size and a more foliaceous nature of the pappus scale being considered a primitive character. However, it has become axiomatic that the characteristics of a taxon may or may not be all at the same phyletic level, *i. e.* all advanced or all primitive. The evolutionary position of some characters of a taxon may be more advanced in relation to the remaining characters of the taxon and those of other taxa.

Helenium vernale is considered to occupy a more advanced phyletic position than *H. pinnatifidum*. This advanced position is confirmed in part by the rather complete decurrency of all but the uppermost *cauline* leaves to such an extent that the stem is more or less winged from node to node, in contrast to the restricted type of decurrency exhibited by *H. pinnatifidum*. The ultimate advancement of this character is met with in *H. flexuosum* and most of the other non-vernal decurrent-leaved species of *Helenium*, where even the bract-like leaves subtending the peduncles are noticeably decurrent.

In *H. vernale* the radical leaves are petioloid in form, being rather sharply contracted toward the leaf base to form a petiole-like structure before re-expanding within the rosette so as to become somewhat sheathing at the place of insertion. Again, this character is encountered in the other vernal species with the exception of *H. campestre* and *H. flexuosum*.

The peduncles and involucral bases of *H. vernale* are glabrous, or occasionally glabrescent. In any case, the achenes of *H. vernale* are always glabrous, and this taxon is the only vernal *Helenium* that has glabrous achenes. It would appear that

H. vernale has been derived from *H. pinnatifidum,* the smaller size of the pappus scales of *H. pinnatifidum* being considered a secondary reduction in that species after the derivation of *H. vernale.*

Helenium Drummondii seems to occupy a phyletic position nearly on a par with *H. vernale,* though some of its morphological characteristics would place it as an intermediate between *H. pinnatifidum* and *H. vernale.* The leaf characters of *H. Drummondii* are like those of *H. vernale.* The size of the pappus scales, though larger than those of *H. vernale,* is more in accord with them than with those of *H. pinnatifidum.* However, the pubescent achenes, pubescent peduncles and lanulose involucral bases of *H. Drummondii* indicate an affinity to *H. pinnatifidum.* The pappus scales of *H. Drummondii* are distinctively slashed into a multitude of *fimbriae* with the *fimbriae* forming more than half the body of the pappus scale and are crimped or crinkled at maturity. The unique pappus scale of *H. Drummondii* represents the only known case of a real elaboration of the pappus scale in the genus *Helenium.* True, many species of *Helenium* possess awned pappus scales but these are regarded as a morphological form correlated with a reduction of the pappus scale rather than as an elaboration of the pappus scale. A final character is that the length of the rays in *H. Drummondii* is usually longer than the length of the rays in the other two taxa of this first subgroup. Such a character may be evaluated as a feature indicating a primitive nature. However, while large rays are usually considered as a primitive character of the *Compositae,* they could possibly also be due, in this case, to a secondary enlargement of the ray, once styliferous, but now neutral. Because of the retention of presumed primitive features, but with the incorporation of several advanced ones, *H. Drummondii* is perhaps best regarded as having had a common derivation with *H. vernale* from *H. pinnatifidum,* but subsequently the two taxa, *H. vernale* and *H. Drummondii,* have had an independent development.

Helenium brevifolium, in the second subgroup, is much like *H. vernale* and *H. Drummondii* in the characters associated with the leaves, both cauline and radical. The cauline leaves are noticeably decurrent and the radical leaves are petioloid. Whereas the basal leaves in the first subgroup are elliptic- to oblong-

linear-lanceolate in outline, the basal leaves of *H. brevifolium* are more oblanceolate to obovate. The few heads are borne in a corymb-like manner, with the long peduncles more or less equal. The peduncles and involucral bases are lanulose, with the pubescence of the involucre base being tomentose at times. The heads are more hemispherical or subglobose than the broad and more or less plane heads of the first subgroup. The disk color is red-brown, with a tendency, however, in some plants to become sordid yellow under certain ecological conditions. The pappus scales of *H. brevifolium* are equivalent in size to those of *H. pinnatifidum* but they differ in form and outline. In *H. brevifolium* the pappus scales are obovate in outline and are more or less distinctly clawed at the base. There appears to be no adequate reason for supposing *H. brevifolium* to have been derived from any member of the first subgroup except through the indirect evidence of the incorporation of the advanced features of the branched habit, multi-headedness and the red-brown disk color.

Helenium campestre appears to have a relationship to both *H. brevifolium* and *H. flexuosum*, much like that of *H. Drummondii* to *H. vernale* and *H. pinnatifidum*. *Helenium campestre* resembles *H. brevifolium* in many of its vegetative and habit characters. However, the ray florets have a tendency to be longer and the pappus scales are the most reduced ones encountered in the vernal species. The pappus scales are only 0.5 mm. long, subobovate to suborbicular in outline and are not clawed. The achenes, moreover, unlike any others in the vernal species, are puberulent rather than hairy-pubescent. In this respect, both in the pappus scales and achene pubescence, *H. campestre* shows a morphological similarity to the annual-biennial species (Section TETRODUS) of Texas and Mexico. On the other hand, *H. campestre*, like *H. flexuosum*, does not have petioloid radical leaves, but rather, the radical leaves are like those of *H. pinnatifidum* and the species of *Helenium* outside of the Section LEPTOPODA. In addition, both *H. campestre* and *H. flexuosum* have pubescent stems and leaves, a character not encountered in the otherwise glabrous-stemmed and glabrous-leaved species of the Section LEPTOPODA.

Helenium flexuosum is quite anomalous in many respects, as far as the other species of this section are concerned. How-

ever, its distribution, neutral and sterile ray florets and perennial nature indicate that it technically belongs to the Section LEPTOPODA. The following features of *H. flexuosum* are aberrant within this neutral-rayed section:

1. The 4-merous condition of the disk corollas, both lobes and stamens
2. The persistent and frequent rayless condition of some specimens from Texas and Florida
3. The bicolor to completely red-colored rays of some Texan and Arkansan specimens
4. The pappus of only five scales, awned and more or less costate for the most part, though occasionally unawned but with acuminate apices
5. The paniculate type of branching
6. The numerous small heads with few broadly deltoid rays
7. The conical receptacle
8. The extended flowering period, ranging from March through November.

These characters, along with the pubescent stems and leaves, and the non-petioloid radical leaves, are much more characteristic of the annual-biennial species (Section TETRODUS) of *Helenium*. In fact, the vegetative similarity of *H. flexuosum* to these annual-biennials of Texas and Mexico is such that, if all the heads were removed, *H. flexuosum* would most likely be taken for one of these annual-biennials, were it not for the perennial caudex.

In addition to these morphological characters, the distribution of *H. flexuosum* seems unusual in relation to that of the other species of this vernal section. The Section LEPTOPODA can be characterized, with the exception of *H. flexuosum*, as plants of a relatively restricted kind of habitat and distribution. These species occur in quite moist locations in the Coastal Plain or bogs of the Piedmont of the southeastern United States. Not one can be regarded as a dominant or even conspicuous element in the flora of this region. M. L. Fernald, though, has aptly termed *H. flexuosum* as a plastic and aggressively weedy plant. It inhabits roadsides, old fields, pine barrens, savannahs, hardwoods and low woods from the Coastal Plain to the Appalachian highlands and is encountered from Texas to Illinois, Florida and Maine.

On the basis of this morphological anomaly and ecological diversity it is suggested that *H. flexuosum* is probably of hybrid origin, long-standing in time, and is now a vigorous and quali-

fied weed. The parentage of this presumed hybrid can only be surmised. A most likely candidate for one of the parents is obviously a species of the Section TETRODUS, probably the plant known as *Helenium elegans*. The other parent would logically be one of the vernal species, either *H. brevifolium* or *H. campestre*. However, the greater morphological similarity of *H. campestre* to *H. flexuosum* indicates that it is the more plausible choice. Moreover, the proximity of *H. campestre* to the range of the annual-biennials is an added consideration. In fact, the morphological similarity of *H. campestre* to *H. flexuosum* and the annual-biennials on one side and the morphological alliance of *H. campestre* to *H. brevifolium* on the other suggests that it may not only be the vernal parent involved in this presumed hybrid combination but that it also exhibits possible introgressed characters of the annual-biennials. It must be stated that despite the presumed hybrid origin of *H. flexuosum* and the relationships suggested above, there is no indication that this hybrid process has occurred more than once. There is no indication, either, of subsequent rehybridizations between *H. flexuosum* and either *H. brevifolium* or *H. campestre*. Possibly some of the variation encountered in *H. flexuosum* where its range is sympatric with or abuts that of the annual-biennial species may be attributable to subsequent hybridizations between these two.

It has been possible to postulate a phylogenetic scheme of development for the species of the Section LEPTOPODA on the basis of morphological characters. This scheme results in a division of the species into two subgroups by using a variety of characters related to the external form and aspect of the plants, for the greater part. By utilizing leaf morphology, pubescence and floral characters, an arrangement of the species within these subgroups has been made, as well as speculations concerning their origin and derivation.

There appears to be no decisive reason for considering the second subgroup as having been derived directly from any member of the first subgroup, except through the fact that the second subgroup is more advanced in its morphological features. This lack of an apparent "ancestor" in the first subgroup for the second subgroup suggests that both subgroups may be more or less independent phyletic lines within the section

LEPTOPODA. This leads to the assumption that the divergent tendencies which led to the ultimate formation of these two subgroups may well have been developed (or segregated) soon after or concomitant with the establishment of the tendency that has culminated in the section LEPTOPODA. Presumably, the origin of the section LEPTOPODA has been from some styliferous-rayed member of *Helenium* or pre-*Helenium* stock. Figure 7 is a diagrammatic scheme presenting these phyletic speculations.

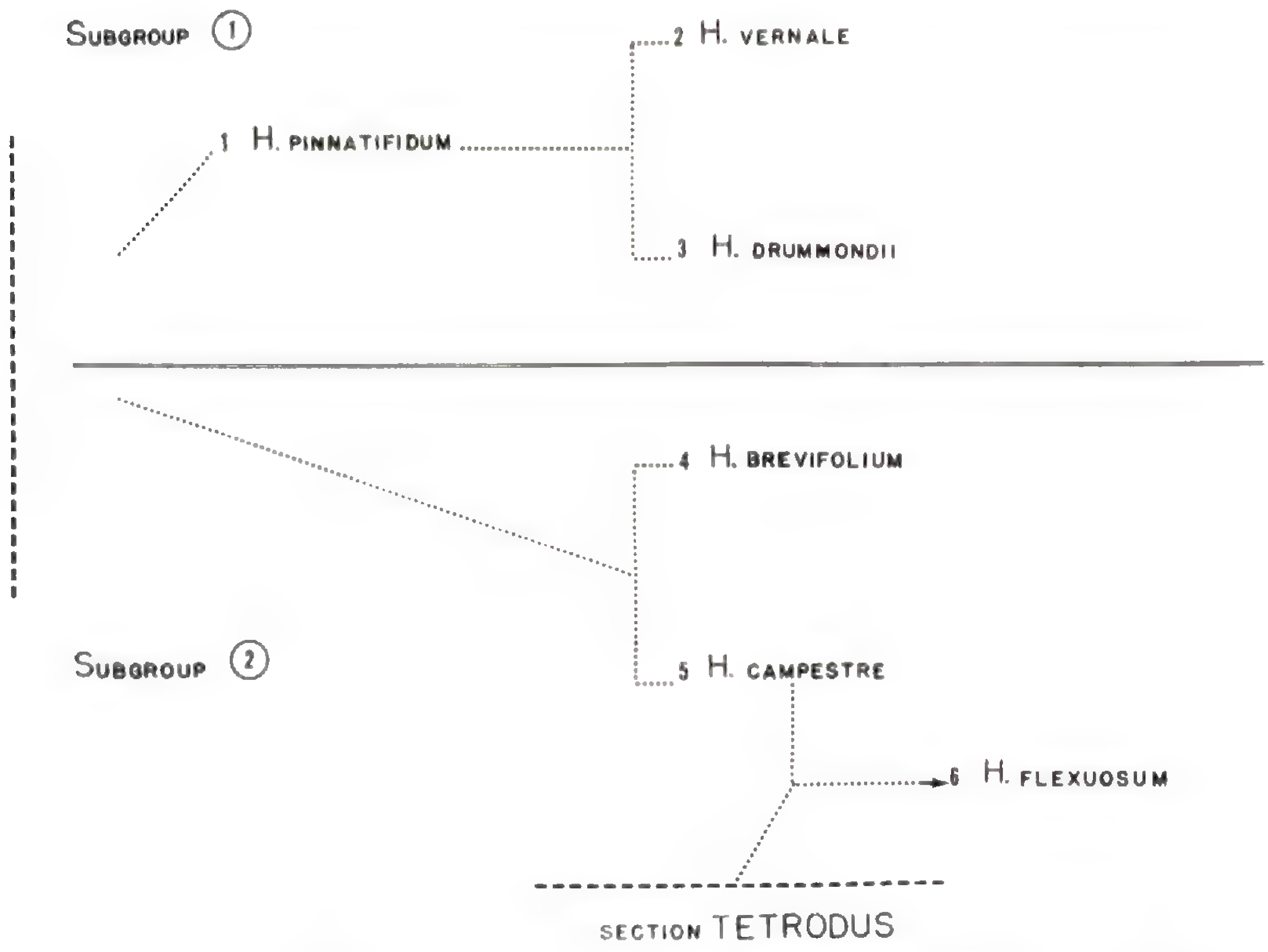

FIGURE 7. Diagrammatic scheme of the supposed phyletic sequence within the Section LEPTOPODA.

Distribution of the Taxa and Geological Considerations

While a phylogenetic scheme based on morphological characters has an inherent significance, it becomes more significant when it is integrated with the distribution of the taxa involved and some of the geological history of the area that these taxa occupy. Map 1 presents the distribution of the three taxa placed in subgroup 1. It demonstrates that all three of these taxa are restricted to the Coastal Plain Province of southeastern United States. Maps 2 and 3 give the distribution of the taxa of the second subgroup and they reveal a distribution that is

Maps 1–3. Distribution of the taxa in Section leptopoda. Map 1. *Helenium pinnatifidum; Helenium vernale; Helenium Drummondii.* Map 2. *Helenium brevifolium; Helenium campestre.* Map 3. *Helenium flexuosum.*

either Piedmont-Coastal Plain or Piedmont, with the exception of the widespread *Helenium flexuosum.*

The distribution of *H. pinnatifidum* (Map 1) shows a break in the Georgia-South Carolina border area, so that the total species distribution can be considered as being composed of two segments; one of which is essentially of Florida and Georgia and the other of North and South Carolina. This break in the distribution of a taxon or taxa at approximately the Savannah River has been noted in other genera of the *Compositae* (*Marshallia, Balduina*) and in *Sabatia* and *Rhynchospora.* Despite this effective division of *H. pinnatifidum* into two distributional segments, no differences between these two segments could be established which were either consistent or definitive. The slight differences in aspect that did seem to exist, namely a less robust habit, are attributed to climatic effects on the Carolina segment in contrast to the climatic conditions that prevail upon the Florida segment. Such differences do not seem to warrant taxonomic distinctions. Perhaps transplant studies and other biosystematic techniques may reveal a basis for recognition of infraspecific taxa in *H. pinnatifidum.* However, until this is demonstrated, *H. pinnatifidum* is treated here as a species without formal or clearly recognizable infraspecific taxa.

Helenium vernale (Map 1) is partly sympatric with *H. pinnatifidum.* However, no evidence of hybridity between these two species was noted in the specimens examined or from field studies. Moreover, *H. vernale* has a flowering peak that occurs approximately two weeks later than that of *H. pinnatifidum,* where the two are sympatric. The distribution of *H. vernale* is for the most part complementary to that of *H. pinnatifidum* as might be expected of two closely allied though distinct taxa. The remarks to be made concerning *H. Drummondii* are reserved and will be made along with those concerning *H. campestre.* At this point, however, it is to be noted that while the distribution of *H. Drummondii* (Map 1) is restricted to essentially eastern Texas and is independent of the distribution of *H. pinnatifidum* and *H. vernale,* it does conform to the pattern of distribution for all three of these taxa in being restricted to the Coastal Plain.

The distribution of *Helenium brevifolium,* although it appears to be extensive on the basis of the plotted locations in Map 2,

is considered to be a restricted type. The inland locations and those of the Atlantic Coastal Plain are a particular kind of habitat. In all the cases where *H. brevifolium* occurs away from the Gulf Coastal Plain, it inhabits either bogs in the Atlantic Coastal Plain or else coastal-plain-like bogs of the Piedmont. This restricted kind of habitat and distribution is considered to be a relic type of distribution, in which an originally Coastal Plain species has persisted in the Piedmont only in those habitats that are similar to the conditions of the Coastal Plain. The occurrence of this Coastal Plain-Appalachian type of distribution has generally been accepted as being correlated with the Schooley peneplane of the Miocene. With the uplift of this peneplane and the change from a coastal-plain-like aspect, plant migrations apparently kept pace with the migration or restriction of the Coastal Plain. However, relic populations seem to have been left behind on the uplifted portion where the environment was suitable for their survival. The distribution of *H. brevifolium* on the Carolina Coastal Plain and the Gulf Coastal Plain would seem to indicate that it had been able to keep pace with the the migration or restriction of the Coastal Plain in at least two areas. The presence of *H. brevifolium* in greatest abundance in the Gulf Coastal Plain is taken to indicate its primary affinity with the Coastal Plain. This is corroborated further by the fact that *H. brevifolium* occupies several kinds of habitats in the Gulf Coastal Plain—savannahs, pine barrens, bogs, flat woods, ditches and pocosins—in contrast to the restricted boggy habitats occupied in the Piedmont. The lack of any known relic populations of either *H. vernale* or *H. pinnatifidum* in the Appalachian Piedmont is interpreted to mean that they have been unable to survive there, if left as relics, and that these species, *H. pinnatifidum* and *H. vernale*, are more obligate Coastal Plain species.

The restricted distribution of *H. brevifolium* on the Atlantic Coastal Plain, occurring only in North Carolina and Virginia, appears to be due to a secondarily imposed restriction. In the case of the Virginia populations of *H. brevifolium*, the climatic conditions of that area probably limit its distribution. Although it is the Coastal Plain, the climate and environment are roughly equivalent to those of the inner Carolina Piedmont. The southeastern North Carolina populations appear to be limited for another reason. *H. brevifolium* here occupies a climatic

area that is more favorable than that of the Carolina Piedmont. However, in the southeastern North Carolina locations, *H. brevifolium* is in competition with *H. vernale* and *H. pinnatifidum*. It seems that *H. brevifolium* is not able to compete with these other two for the favorable habitats and thus is unable to spread southward along the Coastal Plain or even to move out of the bogs that it does occupy. Actually, all three species, *H. vernale*, *H. pinnatifidum* and *H. brevifolium*, appear to be surviving under near-marginal conditions in the North Carolina-Virginia area.

It can be noted from the maps that the areas which support the greatest number of species of the Section LEPTOPODA are the Appalachicola-Chattahoochee River section of Alabama, Florida and Georgia and, secondly, the southeasternmost counties of North Carolina. Geological maps devoted to the advance and retreat of the seas during Pleistocene glaciation and interglacial stages indicate that the Appalachicola-Chattahoochee River area most probably was not inundated completely during the Pleistocene. If so, this area may well have served as a "refuge" for these species that have a Coastal Plain distribution east of the Mississippi River and the more widespread occurrence of these species today may be due to post-Pleistocene migrations away from this area. The idea of considering the North Carolina location as a second "refuge" is tempting. However, though the author has heard that the North Carolina Cape Fear region or a place somewhat to the east of it was not inundated during the Pleistocene, he has been unable to uncover any published account to that effect.

The restricted distribution of *H. Drummondii* (Map 1) to the Coastal Plain of eastern Texas and the restricted distribution of *H. campestre* (Map 2) to the Piedmont of the Ozarks and Ouachita Mountains in Arkansas, both west of the Mississippi and apart from the main distribution of the Section LEPTOPODA, appear to be more than coincidence. The partition in the distribution of these five species shows a positive correlation with the geological phenomenon known as the Mississippi Embayment of the Eocene. If this correlation reflects an actual event in the history of these species, then the Mississippi Embayment has probably served as an isolating agency that has indirectly led to the formation of *H. Drummondii* and *H. campestre*. Presumably, the prototypes of these two species

were segregated from the main distribution of *H. pinnatifidum-H. vernale* and *H. brevifolium*. Since then, development within these geographical segregates has proceeded along sufficiently independent lines leading to the formation of two new species. The morphological distinctness of these two species, *H. Drummondii* and *H. campestre*, along with their obvious relationship to *H. pinnatifidum-H. vernale* (for *H. Drummondii*) and *H. brevifolium* (for *H. campestre*) would seem to indicate that *H. Drummonii-H. vernale* and *H. campestre-H. brevifolium* are vicarious species-pairs.

These vicarious species-pairs provide a reasonable basis for some speculations concerning the history of the Section LEPTOPODA. The fact that a vicarious species-pair occurs in both subgroups suggests that these subgroups have been long-established and probably were functional units prior to the Mississippi Embayment. Moreover, the fact that the morphological characters that serve to define the Section LEPTOPODA are equally expressed in all five members of this section (excluding *H. flexuosum* from consideration) indicates itself that the "Leptopoda" tendency had probably been in existence prior to the Eocene and that the section is an exceedingly natural group.

If these geological-geographical correlations are to be taken at face value, then it seems certain that the *Compositae* were in existence by the Eocene and probably earlier than that. Such a statement is not supported by the fossil record, however, but this is hardly a cause for concern. The herbaceous nature of the *Compositae* for the most part would exclude their being a very good or likely source of fossil material. Another means of time-dating, the pollen record, has also failed to indicate the existence of the *Compositae* in the Eocene. The fact that the *Compositae* are predominantly adapted to insect pollination makes the presence of *Compositae* pollen along with wind-borne pollens in peat deposits highly unlikely.

If *Helenium flexuosum* (Map 3) came into being as a result of hybridization between *H. campestre* and some member of the annual-biennial species of *Helenium* from Texas-Mexico, as it is believed, then its origin must necessarily be later than that of either of the parental species. *Helenium campestre*, it has been pointed out, would seem to have been evolved at sometime since the Eocene, being indirectly formed through

the agency of the Mississippi Embayment. In relation to the annual-biennial taxa, the increasingly arid conditions post-dating the Miocene have been suggested by many authors as the period in which the annual-biennial habit was evolved in many perennial taxa. Assuming that this is so and with an area of northern Mexico-southwestern Texas as a center of origin for the annual-biennial taxa of *Helenium*, post-Miocene time would have witnessed an increasing degree of distribution and speciation of the annual-biennial taxa of *Helenium*.

Presently, the ranges of distribution of *Helenium campestre* and the annual-biennial taxa are not sympatric. The closest known location of any of the annual-biennial taxa to that of *H. campestre* is the occurrence of the plant known as *Helenium elegans* DC. in Hempstead County of southwestern Arkansas. This location is one hundred miles or more away from the nearest known location of *H. campestre*. Within a distance of two hundred miles, however, *H. elegans* is firmly established in the northeastern part of Texas. These presently known distributions of the two taxa, *H. campestre* and *H. elegans*, are not close enough to reasonably assume that hybridization has taken place under the prevailing conditions.

Despite the present conditions, it is entirely possible that the distribution of these two plants may have been sympatric during some past time. Such a time might well have been during the Pleistocene. During the Pleistocene, extensive plant migrations have generally been conceded to have occurred. It would seem probable that such shifts in distribution attendant on the climatic conditions of the Pleistocene, during both the glacial and interglacial stages, may have brought the two components, *H. elegans* and *H. campestre*, into contact. It is presumed that it was at such a time that hybridization between these two occurred, and that *Helenium flexuosum* came into being as the hybrid product. It would also seem that it was during this time that *H. campestre* became introgressed with some of the genetic material of *H. elegans*. Subsequent to this period of contact, the two parental taxa have become allopatric, seemingly through the increasingly more restricted distribution of *H. campestre*.

The hybrid product *Helenium flexuosum*, however, apparently had conferred upon it a wide range of tolerances and has since

become something of a weed. The distribution of *Helenium flexuosum*, as Map 3 exhibits, is the most extensive of any species in the section LEPTOPODA and within this range a wide variety of ecological conditions is encountered. Perhaps significantly enough, the most dense degree of distribution of *Helenium flexuosum* appears to be in the Arkansas-Missouri-Tennessee region.

Finally, to stretch a correlation, it can be noted that the distribution pattern of the perennial, neutral-rayed Section LEPTOPODA and the perennial, styliferous-rayed species of *Helenium* is correlated with the submergence of the Late Cretaceous Period. At this time, with the submergence of Texas and eastern Mexico and the progressive development of the Mesocordilleran Sea, the land mass of North America is supposed to have been divided into two areas: a central-eastern area and the Mesocordilleran region of western America. Provided the *Compositae* were in existence at that time and that the genus *Helenium* had been expressed to some degree, such a geological occurrence might well have been the precipitant factor leading to the formation of the perennial, neutral-rayed species in the east and the perennial, styliferous-rayed species of the West Coast, Arizona, and western and central Mexico. In accordance with this, and on the basis of morphological features as well, the extremely widespread (northern-transcontinental) perennial species *H. autumnale* and the annual-biennials of Texas and Mexico probably had a much later origin from these perennial species of the western land mass.

These speculations concerning the evolution of the Section LEPTOPODA and their correlation with the geological sequence of events may be summarized in the following manner:

1. End of the Cretaceous Period.—The Section LEPTOPODA and the styliferous-rayed portion of *Helenium* (or their precursors) appear to have existed as separate tendencies.

2. Eocene Epoch.—The Mississippi Embayment apparently served as an isolating agency between populations of certain species in both morphological subgroups of the Section LEPTOPODA. These segregated portions then pursued a more or less independent course of evolution resulting in the formation of a vicarious species-pair in both of the subgroups.

3. Miocene Epoch.—Uplift of the Schooley Peneplane and

the subsequent climatic changes induced a more restricted distribution of the species of LEPTOPODA, with the formation of relic populations in the Appalachian highlands (i. e. *Helenium brevifolium*) on one hand and a distribution restricted to Coastal Plain areas on the other hand. Likewise, post-Oligocene aridity possibly induced the formation of the annual-biennial habit within the genus *Helenium*, resulting in the evolution and distribution of the Section TETRODUS, centered on Texas-Mexico.

4. Pleistocene.—The climatic flucuations during the glacial and interglacial stages of the Pleistocene apparently influenced the distribution of both the annual-biennial taxa and *Helenium campestre* to the extent that their distributions became sympatric to some degree. During this time of contact, *Helenium flexuosum* came into being as a hybrid product between the two. During the Pleistocene, the fluctuating sea level must have had its effect on the distribution of those species that inhabited the Coastal Plain. Either successful migrations were made by these species, keeping pace with the restriction and shifting of the Coastal Plain or else certain areas served as "refugia" for these species. From these refugia, never quite inundated by the rising interglacial seas, the species of LEPTOPODA reoccupied the Coastal Plain since the Pleistocene. The Appalachicola-Chattahoochee River section of Alabama, Florida and Georgia seems to be indicated as one of these refugia. A second possible refugium may have been located in the southeastern part of North Carolina, the Cape Fear region, or some area just east of there but now eroded and reduced below sea level.

Species Concepts

The six species of the Section LEPTOPODA have posed very few problems along lines related to species concepts. Each of the species is marked by absolute discontinuities of morphology from any of the other five. Indeed, these discontinuities between the species do not rest on a single character but on several characters so that none of the species should be confused with another. Where the author has merged previously recognized taxa, without taxonomic recognition of the former segregate, he has presented evidence for such a course. This is presented with each species discussion in the systematic section of this paper.

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ARIZ, University of Arizona; BKL, Brooklyn Botanic Garden; CHARL, Elliott Herbarium of the Charlestown Museum; CLEMS, Clemson Agricultural College; COLO, University of Colorado; CS, Colorado Agricultural and Mechanical College; DS, Stanford University; DUKE, Duke University; DWC, Darlington Herbarium, Pennsylvania State Teachers College; EW*, Herbarium of Joseph Ewan, Tulane University; F, Chicago Natural History Museum; FLAS, Florida Agricultural Experiment Station, University of Florida; G, Conservatoire et Jardin Botaniques, Geneva; GA, University of Georgia; GH, Gray Herbarium, Harvard University; IA, State University of Iowa; IDS, Idaho State College; LS, Herbario de la Salle, Colegio de la Salle, Habana; LUNDELL, Texas Research Foundation; MEXU, Universidad National de Mexico, Mexico City; MICH, University of Michigan; MIN, University of Minnesota; MO, Missouri Botanical Garden; MONTU, Montana State University; MV*, Herbarium of Marie-Victorin, University of Montreal; NCSC, North Carolina State College;

[2] The Herbaria of the World. Pt. 1. Regnum Vegetabile, Utrecht, Kemink en Zoon, 2: 1954.

NCU, University of North Carolina; ND, University of Notre Dame; NDA, North Dakota Agricultural College; NEBC, New England Botanical Club Herbarium; NMC, New Mexico Agricultural and Mechanical College; NMEX*, University of New Mexico; NO, Tulane University; NY, New York Botanical Garden; OKL, University of Oklahoma; OKLA, Oklahoma Agricultural and Mechanical College; OSC, Oregon State College; PENN, University of Pennsylvania; PH, Philadelphia Academy of Natural Sciences; POM, Pomona College; RENO, University of Nevada; RM, University of Wyoming; RSA, Rancho Santa Ana Botanic Garden; SDC, South Dakota State College; SMU, Southern Methodist University; SV, Estacion Experimental Agronomica, Habana; TAES, Agricultural and Mechanical College of Texas; TENN, University of Tennessee; TEX, University of Texas; UARK, University of Arkansas; UC, University of California; US, United States National Museum; USC*, University of South Carolina; WIS, University of Wisconsin; WS, State College of Washington; WVA, West Virginia University.

Systematic Treatment

Helenium Section **Leptopoda** (Nutt.) A. Wood

Leptopoda Nutt. Gen. N. A. Pl. **2:** 174. 1818.

Leptophora Raf. Am. Mo. Mag. Crit. Rev. **4:** 195. 1819; Jour. Phys. Chim. Hist. Nat. **89:** 260. 1819.

Leptocarpha Raf. ex Endl. Gen. p. 1383. 1841.

Helenium Sect. LEPTOPODA (Nutt.) A. Wood. Am. Bot. & Fl. 180. 1870.

Helenium Sect. *Leptopoda* (Nutt.) Gray. Proc. Am. Acad. **9:** 204. 1874.

Perennial, vernal herbs of the southeastern United States; foliage and stems glabrous or pubescent; monocephalous or polycephalous; simple, corymbosely or paniculately branched. Radical leaves sessile or petioloid; cauline leaves decurrent. Peduncles glabrous, pubescent, lanose or tomentose. Ray florets neutral and sterile, yellow (-bicolor, red-brown); disk florets hermaphroditic, yellow or red-brown (-sordid). Pappus scales elliptic-lanceolate, oblanceolate, obovate, suborbicular; obtuse and unawned or acute and/or awned; entire, erose or fimbriate; sessile or clawed. Achenes glabrous, hairy-pubescent or puberulent. TYPE SPECIES of the section: *Leptopoda Helenium* Nutt.

A. Heads radiate; the rays well developed, yellow or occasionally red-brown or bicolored (red-yellow).
  B. Disk yellow; plant unbranched; usually monocephalous; plants of the Coastal Plain.
    C. Pappus scales elliptic-lanceolate to elliptic-oblanceolate, the margin entire, erose or at most merely lacerate.
      D. Peduncles decidedly pubescent; achenes pubescent; mid-cauline leaves hardly decurrent, the wing not exceeding 5 mm. in length; radical leaves not petioloid but usually pinnatifid . . 1. *Helenium pinnatifidum*.

D. Peduncles glabrous, rarely glabrate; achenes glabrous; mid-cauline leaves manifestly decurrent, the wings much exceeding 5 mm. and usually extending from node to node; radical leaves petioloid, rarely pinnatifid-incised, usually repand to denticulate . . . . 2. *Helenium vernale.*

C. Pappus scales oblong to oblong-cuneate, deeply slashed into many capillary segments, the segments (*fimbriae*) comprising ½ or more of the total pappus scale body and crimped at maturity . . . . 3. *Helenium Drummondii.*

B. Disk red-brown; plant branched; heads few to many; plants of the Piedmont, Piedmont-Coastal Plain or widespread over the eastern portion of the United States.

E. Pappus scales obovate to suborbicular, unawned and non-costate; plant corymbosely branched; disk corollas pentamerous.

F. Basal leaves glabrous; stem glabrous below; pappus scales obovate, more or less clawed, 1.0 mm. or more in length; achenes hairy-pubescent 4. *Helenium brevifolium.*

F. Basal leaves hairy-pubescent; stem hairy-pubescent below; pappus scales obovate to suborbicular, not clawed, 0.5 mm. or less in length; achenes puberulent . . . . 5. *Helenium campestre.*

E. Pappus scales lanceolate to elliptic-lanceolate, more or less awned and costate; plant paniculately branched; disk corollas predominantly quadrimerous, with 4 lobes and 4 stamens . . . . 6. *Helenium flexuosum.*

A. Heads discoid, disk color red-brown . . . . 6. *Helenium flexuosum.*

1. **Helenium pinnatifidum** (Nutt.) Rydb.

Galardia fimbriata Michx. Fl. Bor.-Am. **2:** 142. 1803. Syntype: Collected by Michaux prior to 1796 in Carolina and Georgia (P), not examined in entirety; photograph of syntype (GH) seen. *Synonym pro parte.*

Leptopoda puberula MacB. in Ell. Sk. Bot. S. C. & Ga. **2:** 445. 1823. Lectotype: Collected by MacBride, Florida (CHARL).

Leptopoda fimbriata (Michx.) A. Eaton, Man. Bot. N. A. 275. 1829 non T. & G. Fl. N. A. **2:** 387. (1842).

Leptopoda pinnatifida Nutt. Trans. Am. Phil. Soc. ser. 2. **7:** 372. 1841. Lectotype: Collected by Baldwin in East Florida (PH).

Leptopoda incisa T. & G. Fl. N. A. **2:** 387. 1842. Holotype: Collected by LeConte in Georgia (NY); isotype ? (PH).

Leptopoda puberula MacB. in Ell. var. *pinnatifida* (Schw.) T. & G. Fl. N. A. **2:** 387. 1842.

Helenium incisum (T. & G.) A. Wood, Am. Bot. & Flor. 182. 1870.

Helenium fimbriatum A. Wood, Am. Bot. & Flor. 182. 1870. ? *nomen ambiguum.*

Helenium puberulum (MacB. in Ell.) A. Wood, Am. Bot. & Flor. 182. (1870) non DC. Prodr. **5:** 667. 1836.

Helenium Nuttallii A. Gray var. *incisum* (T. & G.) A. Gray, Proc. Am. Acad. Arts & Sci. **9:** 204. 1874.

Helenium vernale Nutt. ex A. Gray, Proc. Am. Acad. Arts & Sci. **9:** 204 (1874) non Walt. Fl. Carol 210. 1788.

Heleniastrum fimbriatum (Michx. [A. Gray]) O. Ktze. Rev. Gen. (pt. 1) 342. 1891.

Helenium incisum (T. & G.) Small, Fl. SE. U. S. 1292. 1903. Superfluous name.

Helenium pinnatifidum (Schw.) Rydb. N. A. Fl. **34** (2): 130. 1915.

Helenium vernale auct. non Walt. Fl. Carol. 210. 1788.

Perennial herb, the stem developing from a rosette formed the previous season from the seedling or as an offset from the short caudex; caudex with coarse fibrous roots and often with the persistent fibrous leaf remnants of the prior rosettes. Plant erect, (3–) 4.5–6.0 (–8) dm. in height, single-stemmed, often occurring in clusters, *unbranched and usually monocephalous*, occasionally with two heads and very rarely with three. When the number of heads is greater than one, the secondary heads, arising from buds within the upper leaf axils, are formed at a later period than the terminal one and are decidedly later in flowering than the primary head, as well as being borne on shorter peduncles. Stems sulcate and often anthocyanaceous below, becoming increasingly striate and pubescent above. *Peduncle* striate, decidedly *pubescent at the base of the involucre*, becoming enlarged and fistulous beneath the involucre. Leaves glabrous, strongly uninerved to obscurely 3-nerved, impressed-punctate and resin-atomiferous, becoming reduced in size and form upwards, so the plant appears scapose, especially when viewed in the field. Radical leaves usually intact and present, (3–) 4.5–8.0 (–19) cm. in length, 0.3–1.1 cm. in width; being linear- or elliptic-lanceolate to spathulate, oblanceolate or obovate in outline; margin ranging from merely repand through coarsely and remotely dentate, crenate to pinnatifid; apex obtuse to acute and the bases enlarging somewhat within the rosette so as to become partially clasping, *but with the lower portions of the leaves not contracted so as to be petioloid in form.* Lower cauline leaves (1.2–) 3.5–6.0 (–7) cm. in length, (0.1–) 0.4–0.6 (0.8) cm. in width; linear to linear-lanceolate in outline; margin and apex much the same as in the radical leaves, sessile and with the leaf bases broadly inserted and *not decurrent* along the stem. Mid-cauline leaves becoming more reduced with each successive internode, and essentially the same as the lower cauline with the exception that *the mid-cauline leaves are the only ones of the plant that are decurrent and then only weakly so,* the leaf bases somewhat flared at the insertion so as to be semi-amplexicauline, *the bases being shortly decurrent 0.1–0.5 cm. in length.* Upper cauline leaves reduced to bracteate appendages; linear or linear lanceolate in outline and more or less toothed on the margin; not decurrent, and becoming more remote in disposition with increased position upwards. Involucre biseriate, the outer series exceeding the inner series; phyllaries lanceolate, (4.0–) 5.0–6.0 (–8.0) mm. long, 1.0–1.5 mm. wide at the base, apex acute, pubescent, patent initially, withering with age

and either reflexed or not. Heads convex to depressed-hemispherical, 0.5–1.2 cm. in height, 1.0–2.5 cm. in width; receptacle convex to hemispherical. Ray florets neutral; ligules yellow, 5.0–15.0 mm. long, cuneate, 3(–4)-fid at the apex, pubescent below, resin-atomiferous; achenes abortive and less than the length of the disk achenes. *Disk yellow;* disk florets fertile; corollas 5-lobed, 3.0–5.0 mm. in length, glandular-pubescent on the lobes, resin-atomiferous, cylindric to cylindric-campanulate in outline with a short basal tube; pappus scales oblong to elliptic-oblong, 1.0–2.0 mm. in length, 5–10 in number, *margin erose to lacerate with age,* apex obtuse, though often apiculate to aristillate; achenes 1.5–2.0 mm. long, *hairy on the ribs,* resin-atomiferous, columnar to truncate-turbinate.

DISTRIBUTION: Plants of the Atlantic and Gulf Coastal Plain of the southeastern United States; occurring in wet pine barrens, moist flatwoods, moist savannahs, pine-barren pond margins, roadside ditches and their banks, railroad ditches, borrow pits, pine and marl prairies, cypress ponds and swamps, the everglades; throughout most of Florida except for the westernmost part of the panhandle, northward into Georgia in the Chattahoochee drainage area and along the Atlantic coastal areas into the southeastern counties of North Carolina. (MAP 1)

REPRESENTATIVE SPECIMENS.—**Florida.** Alachua Co.: Fairbands, *Correll & Correll 8945* (DUKE). Baker Co.: Sapp, 25 April 1940, *West & Arnold s.n.* (FLAS). Bradford Co.: Lawtey, 25 March 1940, *Murrill s.n.* (MO). Brevard Co.: Indian River, *Palmer 294* (F, GH, MO). Broward Co.: W. of Pompano, *Moldenke 392a* (DUKE, MO, NY, PENN). Charlotte Co.: pine slough, 21 April 1947, *Frye s.n.* (FLAS). Citrus Co.: 3 m. S. of Red Level, 15 March 1945, *West, Arnold & St. John s.n.* (FLAS). Clay Co.: Hibernia, March 1869, *Canby s.n.* (DS, F, GH, MO, NY, US). Collier Co.: Big Cypress, 16 m. E. of Immokalee, 4 March 1919, *Sheehan s.n.* (NY). Dade Co.: 10 m. SW. of Miami, *O'Neill 7597* (ARIZ, DS, EW, F, ND, NY, POM, RM, US). Duval Co.: near Jacksonville, *Curtiss 1518* (F, FLAS, GH, IA, MIN, MO, NY, OSC, PH, SMU, UC, US). Dixie Co.: 9 m. W. of Cross City, 29 March 1936, *Humm & West s.n.* (FLAS). Flagler Co.: N. of Andulasia, 18 April 1940, *West & Arnold s.n.* (FLAS). Franklin Co.: Apalachicola, *Chapman 2508a* (GH, MIN, MO, NCU, NY, PENN, US). Gadsen Co.: 10 m. W. of Chattahoochee on Rte. 90, *Sargent 6079* (OKLA, RM, SMU). Glades Co.: Lakeport, *Lovett 258* (DUKE). Hardee Co.: Cattle Range Station near Limestone, 17 April 1942, *Kirk s.n.* (FLAS). Highlands Co.: Sebring, *Hunnewell 9059* (GH). Hillsborough Co.: Tampa, *Britton, Britton & Shafer 25* (NY). Indian River Co.: Felsmere, *Small 8865* (NY). Jackson Co.: 5 m. E. of Marianna, *Hood 1549* (FLAS). Lafayette Co.: cypress pond S. of Mayo, 21 May 1941, *West & Arnold s.n.* (FLAS). Lee Co.: vicinity of Fort Myers, *Standley 3* (F, GH, MO, NY, US). Levy Co.: vicinity of Sumner, *Miller 376* (US). Liberty Co.: Bristol, March 1890, *Canby s.n.* (MIN, PH). Manatee Co.: Bradentown, *Tracy 7420* (GH, NY, US). Monroe Co.: S. of Pinecrest, 9 Jan. 1942, *Davis s.n.* (FLAS). Nassau Co.: Callahan, 5 April 1945, *Knight s.n.* (FLAS). Okeechobee Co.: Bassenger, *Howell 1047* (US). Orange Co.: 3 m. NE. of Winter Park, *Walker 1758* (PH). Osceola Co.: Kissimmee, *Bitting 325* (F, FLAS, MO). Palm Beach Co.: Earman, *Randolph 16* (GH). Pasco Co.: near Ehren, *Barnhart 2711* (F, NY). Polk Co.: 5 m. S. of Lakeland, *Blanton 6973* (DS, MICH, MO, ND, PENN, POM, RM, US). Putnam Co.: low pine barrens, Palatka, March 1882, *Mohr s.n.* (UARK). St. Johns Co.: St. Augustine,

April 1875, *Reynolds s.n.* (BKL, F, MICH, NY, PENN, PH, WIS). St. Lucie Co.: Fort Pierce, *Hunnewell 7482* (GH). Sarasota Co.: Osprey, 12 March 1904, *Smith s.n.* (DUKE). Seminole Co.: Lake Munroe, March 1876, *Garber s.n.* (PH, US). Taylor Co.: 4 m. NE. of Penholloway, *Hubricht B2079* (MO). Union Co.: 2 m. S. of Raiford, 22 May 1942, *West & Arnold s.n.* (FLAS). Volusia Co.: Lake Helen, 12 April 1910, *Hood s.n.* (FLAS, MO). Wakulla Co.: Medart, *Moldenke 1125* (DUKE, MO, NY, PENN). **Georgia.** Camden Co.: 1 m. NE. of Colrain, *F. Harper* 1408 (PH). Early Co.: between Cedar Springs and Saffold, *R. M. Harper 3638* (GH, MO, NY[a], US[a]; *not* I, NY[b], MICH, PH, US[b]). Glynn Co.: 2 m. N. of Little Satilla River, Rte. 17, *Correll & Correll 8770* (NCSC, US). Lowndes Co.: along the A. C. L. Railroad, 3 m. E. of Valdosta, *Quarterman 498* (DUKE). Miller Co.: 2 m. W. of Colquitt, *Thorne 3414* (IA). Sumpter Co.: 1 m. S. of Cobb, *R. M. Harper 2213* (F, GH, MO, NY, US). **South Carolina.** Charleston Co.: Owensdaw, S.W. E-2, 22 April 1944, *Hunt, Duncan & Martin s.n.* (GH). Darlington Co.: Black Creek W. of Hartsville, 24 April 1921, *Norton s.n.* (NCU). **North Carolina.** Brunswick Co.: between Southport and Supply, *Godfrey 52273* (DUKE, FLAS, MO, NCSC, SMU). Columbus Co.: near Bolton, *Weatherby 6104* (DUKE, GH, NY, PENN, US). New Hanover Co.: near Carolina Beach, *Godfrey & White 7105* (DUKE, GH, MIN, MO, NY, PH, UC, US). Pender Co.: about ½ m. N. of Burgaw, *Radford & Stewart 203* (NCSC, NCU, TEX, UC). The locations of the following specimens from North Carolina are believed to be erroneous: Rowan Co.: Salisbury, May 1882, *M. E. Hyams* (NY); Iredell Co.: ex herbario Eli Lilly & Co., *Hyams* (MO, NY).—M. E. Hyams is known to have been an herb collector and his home was apparently at Statesville, Iredell Co., North Carolina. Statesville was also the location of an herbarium devoted to drug plants. These extreme inland locations are certainly doubtful on the basis of the remaining distribution of this species. In all probability, the origin of these sepcimens was from the Coastal Plain of North Carolina, a location known to have been visited by Hyams. The author made a search of several Coastal Plain-like bogs in Iredell Co., N. C. in an effort to locate this species there but such efforts were unfruitful, although populations of *Helenium brevifolium* were located in some of these bogs.

The name *Helenium vernale* has been consistently misapplied to this taxon. The results of this continuous misapplication have been twofold: the displacement of the proper name and the continued propagation of the synonym *H. Nuttallii* A. Gray as the proper name for *H. vernale* Walt. (cf. RHODORA **58:** 311–317. 1956.) Consequently, this species must have its rightful name restored to it and *H. vernale* Walt. must be associated with its nomenclatural type and regain its correct position as the legitimate name for the taxon known of late as *H. Nuttallii.*

The earliest name that is both legitimate and validly published for the present species is *Galardia fimbriata* Michx. After a study of photographs of the specimens on which this name is based—supplemented by data provided by Monsieur Leandri of the Muséum National d'Histoire Naturelle concerning the

actual specimens—and in conjunction with an analysis of the original description, it has been determined that the specimens on which the name *Galardia fimbriata* is based belong to two different taxa. Michaux's description is so generalized as to encompass both elements. One of these elements is *Helenium vernale* Walt. dating from 1788. The remaining element is to be associated with the name *Galardia fimbriata* Michx. dating from 1803.

In 1829, Amos Eaton transferred *Galardia fimbriata* Michx. to *Leptopoda* (Man. Bot. N. A. 275. 1829.) Although Eaton misattributed the authority of *Galardia fimbriata* to Willdenow, the footnote referring to the new combination "[Leptopoda] puberula, Macbride. Galardia, Mx." clearly indicates the basionym and the combination is to be written as *Leptopoda fimbriata* (Michx.) A. Eaton. In 1842, Torrey and Gray (Fl. N. A. **2:** 397.) published the later homonym *Leptopoda fimbriata* T. & G. Following the description of this species they cite: "—Galardia fimbriata Michx. fl. 2. p. 142?" As the distribution of this species they list: East Florida, based on a specimen collected by Leavenworth; and Texas, based on specimens collected by Drummond and another specimen collected by Leavenworth. The distribution of *Galardia fimbriata* given by Michaux is: "in paludosis apricis, a Carolina ad Floridam." In the comments which accompany the description, Torrey and Gray state: "This is very probably not the Galardia fimbriata of Michaux, although it best accords with his character; but since that name cannot properly be employed for either of the two species already described, it may in any case be adopted for the present very distinct species, for which it is very appropriate." The fact that Torrey and Gray cite Michaux with a query and the two phrases "is very probably not" and "may in any case be adopted" indicate that Torrey and Gray were not transferring *Galardia fimbriata* into *Leptopoda* but rather were establishing a new species with the epithet *fimbriata*, based on the Leavenworth and Drummond material. As a later homonym of *Leptopoda fimbriata* (Michx.) A. Eaton, the *Leptopoda fimbriata* of Torrey and Gray is, of course, illegitimate.

In 1870, Alphonso Wood merged the genus *Leptopoda* with *Helenium* and made the combination *Helenium fimbriatum*.

There is no direct indication made by Wood as to which of the three possible combinations of the epithet *fimbriata* served as the basionym in this new combination; i.e. *Galardia fimbriata* Michx., *Leptopoda fimbriata* (Michx.) A. Eaton, or *Leptopoda fimbriata* T. & G. This name, *Helenium fimbriatum* A. Wood, however, under the provisions of Article 65 of the Code, has been declared to be an ambiguous name and is rejected from use in the genus *Helenium*. The discussion related to this action is to be found within the treatment given to *Helenium Drummondii* in this paper.

The next available name is *Leptopoda puberula* MacB. in Ell. However, in transferring this epithet to *Helenium*, Wood created a later homonym to that of DeCandolle and this name must be rejected under the injunction of Article 64. Chronologically, *Leptopoda pinnatifida* Nutt. has priority over the remaining names that apply and the epithet *pinnatifidum* is the legitimate one for this species. However, the circumstances surrounding the publication of *Leptopoda pinnatifida* require clarification.

Nuttall, using his customary format in publishing names that he considered new to science, did so in the following fashion: "*Leptopoda * pinnatifida;* . . ." with the asterisk indicating a new name and the semicolon indicating that the description is to follow. Just after the semicolon, in the case of *L. pinnatifida* however, Nuttall included in parenthesis, "; (Herb. Schw.)." Even though the type specimen bears no reference to DeSchweinitz, it would appear that Nuttall intended this reference to DeSchweinitz to indicate only that the specimen for this new name came from DeSchweinitz's herbarium. Moreover, the type does not bear the inscription "pinnatifida" in any hand other than Nuttall's own so that the epithet cannot be considered to be a manuscript name picked up by Nuttall. Indeed, the type specimen has a label which repeats Nuttall's characteristic format and there is no indication that the herbarium specimen was ever in DeSchweinitz's hands. Moreover, there is no specimen of *Leptopoda pinnatifida* amongst the Nuttall material at the British Museum which might refute such an interpretation or indicate prior ownership by DeSchweinitz. Actually, a specimen that does bear a reference to DeSchweinitz is a syntype of *Helenium brevifolium* Nutt. at the

Philadelphia Academy of Natural Sciences which has the notation "in Herb. Schw. sub nomine *Rudbeckia* (Yadkin)."

In the *Flora of North America* (1842) and in the *Synoptical Flora* (1884) the epithet *pinnatifida* is attributed to DeSchweinitz despite an interim reversion to Nuttall as the author by Gray in 1874. It is probably from the first two citations that Rydberg perpetuated the error in author citation that Torrey and Gray propagated. The new combination published by Rydberg in the *North American Flora* (1915), despite the erroneous author citation, is the legitimate name for this taxon. It should be emended so as to have reference to the correct author and nomenclatural type and is to be written as follows: *Helenium pinnatifidum* (Nutt.) Rydb.

The binomial *Helenium vernale* Nutt. ex A. Gray (Proc. Am. Acad. Arts & Sci. **9:** 204. 1874) is probably a bibliographic error on the part of Gray who misattributed the epithet to Nuttall instead of correctly so to Walter. Rydberg, in dealing with the synonymy of this taxon, seems to have interpreted this error of Gray's as being Gray's intention to publish the binomial *H. vernale* A. Gray. In indicating this supposed homonymity Rydberg cites *H. vernale* Watt. (N. A. Fl. **34** (2): 130. 1915) as the prior homonym. In itself, the "Watt." is inaccurate as to authority, though it probably represents a typographical error. In either case, both of the Rydbergian references (*H. vernale* Gray and *H. vernale* Watt.) have no status under Article 37, in that they are not validly published, being merely cited as synonyms.

Early in the last century James MacBride provided Stephan Elliott with an adequate basis[4] for separating this species from *Helenium vernale* Walt., the taxon with which it is most often confused. *Helenium pinnatifidum* (Nutt.) Rydb. may be distinguished from *H. vernale* Walt. by the following characters:

1. Mid-cauline leaves barely decurrent, the wing being rapidly tapered and 5 mm. or less in extension along the stem

[4] In a letter now mounted with the lectotype of *Leptopoda puberula* MacB. in Ell., MacBride provided Stephan Elliott not only with epithets but with descriptions as well of two taxa which Elliott used practically *verbatim* for *Leptopoda puberula* and *L. decurrens* in his *Sketch of the Botany of South Carolina and Georgia*. For this reason, these binomials are attributed here to MacBride with Elliott as the author of the work in which they were published (cf. Article 46, recommendation 46B, 1956 ed., Int. Code Bot. Nom.)

2. The achenes are pubescent, usually very markedly so, with long rufous hairs

3. The peduncle is pubescent, especially in that portion immediately below the involucre proper

4. The radical leaves are not petioloid.

Subsequent to MacBride and Elliott, Nuttall described the species, *Leptopoda pinnatifida.* This differed from *L. puberula* (which Nuttall did not recognize) primarily on the basis of "radical and lower leaves incisely pinnatifid, with remote segments" as opposed to the "slightly repand, with an occasional serrature" of Macbride's *L. puberula.* Beginning with Torrey & Gray, who treated *L. pinnatifida* as a variety only of *L. puberula*, a realignment of *L. pinnatifida* was started. This realignment ended with Gray's treatment of both *L. puberula* and *L. pinnatifida* as synonyms (though misapplied) of *Helenium vernale.* Rydberg in his treatment of 1915, however, recognized both of the leaf forms as being specifically distinct, one as the misapplied *H. vernale* and the other as *H. pinnatifidum.*

In the course of this revision no other morphological character could be found that had a correlation with the pinnatifid leaf, nor could any habitat preference or geographical correlation be made. In the absence of any such correlation, the pinnatifid-leaved plants are here recognized as being the same taxon as *Leptopoda puberula* and are treated as such, although the epithet *pinnatifidum* must, perforce, be used. As particular corroborative data, Figure 8 is presented. It presents ideo-diagrams of the basal leaves from selected plants of a mass collection made by Dr. R. K. Godfrey (*Godfrey 53147*, undistributed) in a single locality of Franklin County, Florida. The upper row represents leaves from plants grown in the Duke University greenhouses while the lower two rows represent leaves from pressed plants (soaked 12 hours so as to approach the living condition) collected in the field. The persistence of variation in the leaf margin of these plants of the same colony which were grown in the greenhouse would indicate that the margin variation is related to some genetic factor(s), whereas the extreme variation within the field-collected plants would indicate that the final expression of this margin character is mediated to a large extent by environmental conditions and probably on a very micro-habitat basis.

FIGURE 8. Ideodiagrams of the basal leaves of *Helenium pinnatifidum* (*Godfrey 53107*, Franklin Co., Fla.) Row A. Leaves from plants grown under greenhouse conditions. Row B-C. Leaves from plants as they were collected in the field.

Amongst all the specimens of *Helenium pinnatifidum* examined, only three could be considered as possessing glabrous achenes. Torrey and Gray, on the basis of a specimen of *H. pinnatifidum* collected in Georgia by LeConte which had glabrous achenes, published the species *Leptopoda incisa*. This binomial has been appearing off and on in the literature as a recognized taxon at various levels. The first of the three specimens referred to above (*Moldenke 392a*, Broward Co., Fla. DUKE) has achenes whose surfaces are warty, rather than truly glabrous. The duplicates of this collection (MO, NY, PENN) however, have achenes that are of the usual hairy-pubescent kind found in this species. The second specimen (*Ledin s. n.*, 20 Feb. 1947, Dade Co., Fla. FLAS) has achenes that are entirely glabrous. The third specimen, the type of *L. incisa*, has glabrous achenes but a probable duplicate of this collection by LeConte (PH) has the usual hairy-pubescent achenes, unlike the glabrous ones of the type. Otherwise, these three specimens agree with the others of *H. pinnatifidum*. In this treatment, on the basis of such a sporadic occurrence and extremely low frequency, no formal taxonomic recognition is given to those rare specimens of *H. pinnatifidum* that possess glabrous achenes.

The pappus scales of *Helenium pinnatifidum* provide no reliable means for distinguishing between it and *H. vernale*. The pappus scales of both are similar and exhibit the same patterns of variation. However, the similarities can be taken to confirm the closeness of relationship between these two taxa.

The break in the distribution of this species into two segments, one centering on Florida and the other on the Carolinas, is vivid enough to have stimulated a close analysis. Despite a close scrutiny of the specimens no significant geographical correlations with morphological features could be observed. Whether the absence of specimens from the South Carolina-Georgia Coastal Plain areas is a real absence or is the result of absence of collecting in that area, it is impossible to state. However, the author made a specific trip through the counties of Florence, Berkeley, Williamsburg, Dorchester, northern half of Charleston, Georgetown, Horry, Marion and Dillon of South Carolina in the spring of 1955 particularly searching for plants of this species. The results of this search were negative.

(To be continued)

Sisyrinchium Bermudiana L. instead of S. angustifolium Miller.—In 1946 Fernald gave a lengthy discussion of the identity of Miller's species, chiefly to explain his rejection of *S. graminoides* Bicknell (Rhodora **48:** 152–160). His adoption of the name *S. angustifolium* is followed in such recent European works as Clapham, Tutin and Warburg's Flora of the British Isles ("Mill. sec. Fernald"), and Hylander's Nordisk Kärlväxt-flora (listing as synonym *S. Bermudiana* L. "p.p., em. Farwell 1918—non em. Mill. 1768"). Not mentioned by Fernald is Farwell's earlier discussion (Mem. Torrey Bot. Club **17:** 82–83, 1918), pointing out that the binomial *Sisyrinchium Bermudiana* L. was intended by its author to designate a Virginia species, not one from Bermuda. The trivial epithet is an early generic name, not a geographic adjective. This had been pointed out still earlier by Thomas Morong (Bull. Torrey Bot. Club **20:** 467–468, 1893). All three of the diagnostic phrases cited by Linnaeus for his var. α refer to Virginian plants. For the species he says, "*Habitat in* Virginia, β *in* Bermudis." His supplementary comments ("Planta α, *in loco natali,* Folia *saepe & scapum filiformia gerit, at si probe examinetur, tamen ancipitia; haec per gradus ad cultas staturam adscendere observatur*") suggest, as Farwell said, that he probably saw only material from Virginia. Hylander errs in writing "em. Farwell" and "em. Miller," for no such emendation was possible. Miller was simply out of order in making var. β the type, as was Fernald in following him. The correct name for the Bermuda plant is *S. iridioides* Curtis, if treated as species (the generally accepted evaluation of it); there appears to be no epithet for it in varietal status. The Linnaean species must, however, be cited as emended in a different sense, since it was based on a mixture of two continental ones. (Cf. Fernald's remarks on Plukenet's and Dillenius's plates, l. c. p. 155: the former represents *S. mucronatum* Michx., the latter *S. angustifolium,* and both are cited by Linnaeus for his typical variety.) We may consider that despite his misconception as to the identity of typical *S. Bermudiana* (which had nothing to do with Bermuda), Fernald did at any rate exclude *S. mucronatum* unequivocally. The correct formal designation in full for *S. angustifolium* Miller is then *S. Bermudiana* L. em. Fernald, l. c. This species is treated in the New Britton & Brown Illustrated Flora under

the much later synonym *S. graminoides* Bicknell, while the binomial *S. angustifolium* is misapplied in the same work to *S. montanum* Greene var. *crebrum* Fernald.—Lloyd H. Shinners, Southern Methodist University.

Cycloloma in Maryland.—Since 1940 *Cycloloma atriplicifolium* (Spreng.) Coult. has been found in Wicomico County, Maryland, thriving in deep sand near the southern corporate limits of Salisbury. At the intersection of Middle Boulevard and the Peninsula highway there is a pine wood lot in the northwestern corner and an open undeveloped weedy area in the southwestern corner. The soil is deep sand. Where there is evidence of some organic matter and slight fertility one finds a population of "poor Joe," *Diodea teres*, and other plant indicators of infertile soil. On slightly raised areas which appear to be of pure sand with no evidence of fertility, too infertile for "poor Joe," one finds plants of *Cycloloma*. The plants are scattered and have wide spreading roots, typical of sand habitats. In western states *Cycloloma* is reported as growing in sandy soil and on sand dunes.

Cycloloma is not recorded by Tatum in Flora of Delaware and the Eastern Shore. Gray's Manual (8th Ed.) gives the eastern range from Quebec to New Jersey. Considering the sandy nature of much of the Del-mar-vian peninsula it is likely that *Cycloloma* occurs more frequently. Specimens from Salisbury have been deposited in Gray Herbarium.

Cycloloma atriplicifolium, (Spreng.) Coult., Mem. Torr. Cl. 5: 143, 1894, is based on *Salsola atriplicifolia*, Spreng., Bot. Gart. Hal. Nactr. 1: 35. 1801. By Michaux it was named *Salsola platyphylla*, Michx., Fl. Bor. Am. 1: 174. 1803.—A. B. Massey, Virginia Polytechnic Institute.

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PLATE 1229. Ivar Tidestrom, 1864–1956.

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IVAR TIDESTROM, 1864–1956

W. A. Dayton and S. F. Blake

Ivar Tidestrom, who prided himself on being a spiritual descendant and compatriot of Linnaeus, was born on September 13, 1864, on his father's estate "Lanna" in the parish of Hidinge, province of Närke or Nerike, Sweden, 12 English miles from the city of Örebro. His father's name was Constantin Tideström, his mother's maiden name Brita Ulrika Wallmo; they were both of good family. He was the third of five children, three girls and two boys. The father was an active and intelligent man and farmed the estate, to which a lime pit and lime-works belonged. Ivar went to school in Örebro, and even at an early age displayed interest in botany and in the rich flora of the calcareous soil around Hidinge. At school he incurred the dislike of a German teacher who would not promote him, and it is possible that some of his later antipathy for the Germans as a nation, rather than as individuals, had its origin in this circumstance. At any rate, not long after, in or about 1881, he ran away and came to New York. There all his baggage was stolen and at first he had a difficult time.

Soon after his arrival in this country he enlisted in the 8th Cavalry for service in the Southwest. Before signing up he gave the recruiting sergeant his true age (17), which was too young for enlistment. Seeing the applicant's intense desire for service, the sergeant told him to walk around the block, come back and represent himself as "18," and his name could be placed on the roster—which was done! In 1884 Tidestrom

injured his hip in a fall from his horse and left the Army temporarily but in 1887 he was back in the saddle again with the 4th Cavalry. In 1891 he started an engineering course at the University of California at Berkeley but became a student assistant to Dr. Edward Lee Greene and soon switched his major interests to botany. His relationship to Dr. Greene continued close and, shortly after Greene left California in 1895 to accept a professorship at Catholic University of America in Washington, D. C., Tidestrom joined him, receiving the degree of Ph.B. in 1897 from Cardinal Gibbons.

Tidestrom was an ardent patriot and a worshipper of "Teddy" Roosevelt, whom he followed in 1898 in the Spanish-American War in which he participated in the Battle of San Juan Hill, although he was not actually a member of the "Rough Riders." He always regarded himself as a soldier. When World War I broke out he wept because he was not permitted to reinlist, and he urged others to enter the military services before being drafted. It took constant urging before his pride would allow him to ask for the pension which was legally due him. Mustered out of the Army, we find him in 1903 as an assistant botanist in the old Bureau of Plant Industry, under the late Dr. Frederick V. Coville, at the munificent salary of $40 a month. A year later, it might be added, Prof. Greene became an associate in botany at the Smithsonian Institution, the Curator of whose herbarium was Dr. Coville, who also was Botanist of the Bureau of Plant Industry in the U. S. Department of Agriculture. In 1910 Dr. Greene's salary was paid by the Forest Service to identify all but the grasses and sedges of the enormous number of range plants that were then being collected on National Forest ranges. Dr. Greene's comments on many of these collections by rangers and other forest officers largely untrained in the niceties of plant collecting were decidedly frank. He would write on a folder: "Umbellifers are never identified without fruit and are never collected by Forest Service men with them," or "It is impossible to imagine a more mildewed bale of hay than the enclosed." However, he did occasionally compliment a more careful collector and described perhaps a hundred new species from these collections. In those days such terms as ecotype, hybrid swarm, and polyploid were unknown in tax-

onomic circles and Greene would frequently write on a folder "New to me, hence new to Science," which was often an easy way to dispose of a specimen which could not be identified at sight. Or he would surreptitiously drop the specimen in a waste basket and observe that, "if the Almighty wished to preserve this plant creation, He could doubtless reproduce it again!" In fact, he did most of his determinations of Forest Service material before 9 o'clock in the morning, remarking that he, "the greatest living botanist," was being paid $1200 a year by the Forest Service and they rated that sufficient recompense for his work!

Shortly before Greene's death in 1915, Tidestrom (still under Coville's direction and administrative control) succeeded to his chores for the Forest Service and, needless to say, did a thorough and conscientious job. To aid him in his duties he began work toward a series of western State Floras by preparing a mass of keys but, unfortunately, little of this was finished and hence it remained unpublished. Other unfinished tasks included floras of Alaska and the Aleutian Islands and monographs of *Astragalus* and *Hookera*, in the initiation of the latter of which the senior writer of this sketch participated.

Tidestrom was sometimes criticized by fellow systematists because he was not essentially a monographer although, as just indicated, he had done considerable preliminary work in monographing American *Astragalus* and *Hookera*, as well as *Populus*, a genus in which he took special interest. His first four publications (see bibliography below) were on ferns and fernworts. He is best known for his "Flora of Utah and Nevada" (1925). Before this flora appeared the senior writer of this sketch suggested to Mr. Tidestrom to do what Standley did, publish a list of the plants originally described from the area in which he was working. Apparently time did not permit and this probably accounts for some serious omissions, such as the failure to include the remarkable and nearly endemic genus *Blepharidachne*. Despite its rather skeletonic character, particularly in its statement of ranges, and the frequent absence of one member of a presumptive pair of contrasting characters in the keys, this book has been a valuable working tool for botanists for more than 30 years and is still the only available

manual for the identification of specimens from Nevada as a whole, and a more convenient treatise than Rydberg's for material from Utah.

Tidestrom's larger and later book, the "Flora of Arizona and New Mexico" (1941), written jointly with Sister Kittell, unfortunately anticipated by but a year Kearney and Peebles' much more carefully elaborated "Flowering Plants and Ferns of Arizona," but was useful particularly because Wooton and Standley's "Flora of New Mexico" was more than a quarter-century old and long out-of-print. The typography of the book, reproduced by an offset process, was not pleasing, the family Oxalidaceae was omitted, the senior author took liberties with the nomenclature (for example, in restoring the pre-Linnaean *Pentastemon*), and these and other defects led to a bitter review in The American Midland Naturalist. Despite all this, it is probably safe to say that when he retired from the Department of Agriculture in 1934 there were few botanists who had wider first-hand knowledge of the flora of the entire United States than he did.

Tidestrom's first considerable publication was the beginning of a flora of Maryland, called "Elysium Marianum," of which three parts covering pteridophytes, gymnosperms, and some of the amentiferous orders appeared in 1906–10. It was illustrated with photographs, set up in type, bound, published and distributed by Tidestrom himself. This work allowed him to give his ideas and personality full sway. In his preface he remarks: "How much easier it is to appreciate the Good, the Beautiful and True about us, when we have some knowledge —be it ever so small—of plant life." He quotes from Seneca: "Si ad naturam vives, numquam eris pauper; si ad opiniones, numquam eris dives." And, from the 19th Psalm: "Coeli enarrant gloriam Dei, et opera manuum ejus annunciat firmamentum;" he adds that such works "are in an equal measure applicable to Flora's realm." Tidestrom did not credit his beloved Linnaeus with such genera as *Pinus* and *Populus* but rather Plinius, as did his predecessor, Greene, in the latter's earlier floras of the San Francisco Bay region. Tidestrom credited Theophrastus with the authorship of the maidenhair fern genus, much to the approbation of Dr. Greene, who said

in his review in The American Midland Naturalist: "To Mr. Tidestrom's mind evidently to credit Linnaeus with *Adiantum* is to intercalate a children's fable into the midst of a page of science," and cited Baillon in further support of this thesis.

Tidestrom had a gift for friendship and hospitality. Anyone who has been his guest at his well-loved home, "Valhalla," in Maryland just outside the District of Columbia, will remember him as an outstanding host. His bonhomie and courtesy became proverbial. He was silent and respectful under Dr. Greene's sardonic humor. "Say juniper, Tidestrom," Dr. Greene would demand. "Yooniper, Dr. Greene" came the reply. The doctor would shake his head and declaim: "No Swede can speak English!" Once, when he was crossing a branch of the Potomac to a nearby island on a barge operated by hand from an overhead cable, some children tipped over the unstable craft, upsetting and completely immersing Tidestrom, pipe, beret and all. But he soon emerged laughing and completely unconcerned. Dr. Coville used to say "Tidestrom is a lot of fun!" He was a member of the Biological Society of Washington, the Washington Biologists' Field Club, the Botanical Society of Washington, and the Torrey Botanical Club.

Once, in describing a collecting trip down the Potomac River and Chesapeake Bay with a very eminent botanist, he said that, when night came, the person referred to removed his coat and shoes and lay down on the deck to sleep. "Ladies were going by," Tidestrom recalled with obvious shock; "I was embarrassed and spent the night sitting up in a chair. My father was a *gentleman* and he brought me up to be a *gentleman!*" And a certain Old World courtliness was inherent in the man, as he doffed his cap (usually a French beret) and was wont to bow on meeting people.

Tidestrom's first marriage ended unhappily, his wife leaving him for another man. A close friend reports that he spent an entire night with Tidestrom in a fortunately successful effort to prevent an armed attack on the seducer. Tidestrom later (1926) married the widow of a French veteran of World War I, Marie Demarest (1887–1944) of Normandy. They were a devoted couple. In her memory he wrote an ode, "V Day." Tidestrom was something of an amateur musician; he played

the piano and composed and had printed several pieces of a martial character. His last trip, when alone and quite feeble, in fact paralyzed on one side so that he could not walk without assistance, was to Sweden in the spring of 1954, for a family reunion—his first trip to his fatherland in 50 years. The 300 plants collected by him on that occasion with the assistance of his niece, Miss Amy Simonsson of Åsljunga (to whom we are indebted for the details of his early life), were later deposited in the U. S. National Museum collection where about 14,000 other sheets of his specimens are also filed. On his return trip he visited Washington for the last time and renewed old friendships.

Tidestrom was an avid reader. He loved France particularly and would often remark "Culturally, I'm a Frenchman."[1] After World War I he supported a French war orphan for a number of years. He was conversant with much of French literature and had a wide familiarity with the history of western Europe. He was quite a linguist, speaking, besides Swedish and English, French, Spanish, and German. He read Latin, Danish, and Norwegian well, and was, in addition, a student of such diverse languages as Arabic, Gaelic, and Russian.

Tidestrom was originally a Lutheran, later a Presbyterian, and became a convert to Roman Catholicism after his second marriage. He retired from the U. S. Department of Agriculture in 1934 at the age of 70, and thereafter served in the Botany Department of Catholic University under Dr. Hugh T. O'Neill for 5 years, retiring in 1939 and moving to Florida where he died at St. Petersburg on August 2, 1956. He was buried in Arlington National Cemetery, Arlington, Virginia, with military honors August 8, 1956. He is survived by a sister and two nieces in Sweden. He is commemorated in the genus *Tidestromia* Standl. of the Amaranthaceae and in a number of west-American herbs, including *Penstemon tidestromii* Pennell, *Pseudocymopterus tidestromii* Coult. & Rose, and *Viola tidestromii* Greene.

[1] Apparently his affection for France and things French led him to think and speak of himself as French to such an extent that most of his friends regarded him as partly of French extraction. His niece Miss Amy Simonsson, however, informs us that the Tideström family was Swedish, with some German admixture, for as far back as it can be traced, and that the only known French element is provided by a sideline in his mother's family, a sister of his maternal grandfather having married a French émigré to Sweden somewhere about 1800.

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A REVISION OF THE VERNAL SPECIES OF HELENIUM (COMPOSITAE)

Howard F. L. Rock

(continued from p. 158)

2. **Helenium vernale** Walt.

Helenium vernale Walt. Fl. Carol. 210. 1788. Lectotype: Herb. Walt. (BM), presumably collected by Walter at St. John's Parish, Berkely Co., S. Carolina, prior to 1788. Not examined; photographs seen (BM, GH).

Galardia fimbriata Michx. Fl. Bor.-Am. **2:** 142. 1803. pro parte.

Leptopoda Helenium Nutt. Gen. N. A. Pl. **2:** 174. 1818. Syntype: (PH); Syntype (BM—not seen).

Leptopoda helenioides Cass. Dict. Sci. Nat. **26:** 80. 1823. Superfluous name, as an avowed substitute.

Leptopoda decurrens MacB. in Ell. Sk. Bot. S. C. & Ga. **2:** 445. 1823. Lectotype: Collected by MacBride, May-July, Fla. (CHARL).

Leptopoda floridana Raf. Atlan. Jour. **1** (4): 147. 1832. ? *Nomen dubium.*

Leptopoda denticulata Nutt. Trans. Am. Phil. Soc. ser. 2. **7:** 373. 1841. Syntype: Collected in Georgia (PH); Syntype (BM—not seen).

Helenium Leptopoda A. Wood, Am. Bot. & Fl. 182. 1870. An inverse combination based on *Leptopoda Helenium* Nutt.

Helenium Nuttallii A. Gray, Proc. Am. Acad. Arts & Sci. **9:** 204. 1874. Substitute name for *L. Helenium* Nutt., *L. deuticulata* Nutt. and *L. decurrens* MacB. in Ell.

Heleniastrum vernale (Walt.) O. Ktze. Rev. Gen. (pt. 1) 324. 1891.

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Perennial herb, the stem developing from a rosette formed the previous season from the seedling or as an offset from the short caudex; the caudex with coarsely fibrous roots and often with the persistent fibrous leaf bases of prior rosettes. Plant erect, (3.1–) 4.0–6.5 (–7.9) dm. in height, single-stemmed, often occurring in clusters. *Unbranched and usually monocephalous,* occasionally with two heads, very rarely three, and then, when the number of heads is greater than one, the secondary heads arising from buds in the upper leaf axils, formed at a later period than the terminal one and decidedly later-flowering than the primary one and borne on shorter peduncles. Stems glabrous below, sulcate and often anthocyanaceous, becoming striate *but glabrate at most,* above. Peduncle striate, *usually glabrous, occasionally glabrate,* at the base of the involucre, and becoming enlarged and fistulous beneath the involucre. Leaves glabrous, strongly uni-nerved, with the lateral veins obscured, impressed-punctate, resin-atomiferous, becoming reduced in size upwards, but usually not so as to appear quite as scapose-looking as in the preceding species. Radical leaves usually intact and present, (3.0–) 6.5–17.0 (–25.0) cm. in length, (0.4–) 0.6–1.0 (–1.5) cm. in width, being linear-oblanceolate, elliptic-oblanceolate to less frequently spathulate or obovate; margin ranging from entire through repand, coarsely and remotely dentate, to *rarely pinnatifid;* apex obtuse, acute, or acuminate; *the basal portion of the leaf tapering to form a relatively long petioloid structure* but enlarging again at the base within the rosette so as to become partially clasping. Cauline leaves similar to the basal leaves, broadly inserted and the mid-cauline ones *decurrent along the stem, the wings extending 2 cm. or more along the stem,* usually from node to node; becoming reduced in size upwards, more remote in disposition upwards, linear-lanceolate and more prominently toothed. Involucre biseriate, the outer series exceeding the inner; phyllaries lanceolate, 7.5–11.0 mm. long, 1.0–1.5 mm. wide at the base, apex acute, glabrate to glabrous, patent initially, becoming withered in age and not particularly reflexed. Heads convex to depressed-hemispherical, 1.4–1.8 cm. in height, 0.7–1.3 cm. broad; receptacle convex to hemispherical. Ray florets neutral; ligules yellow, 1.3–1.7 cm. long, cuneate 3–(4–) fid at the apex, pubescent to glabrate below, resin-atomiferous; achenes abortive and less than the length of the disk achenes.

Disk yellow; disk florets fertile; corollas 5-lobed, 5-stamened, (3.0–) 4.0–4.5 (–5.0) mm. in length, glandular-pubescent on the lobes, resin-atomiferous, cylindric to cylindric-campanulate in outline with a short basal tube; pappus scales oblong, elliptic-oblong to elliptic-oblanceolate, 5–10 in number, 1.5–2.0 (–2.5) mm. in length, *margin erose to lacerate*, apex obtuse though oft-times apiculate to aristillate; achenes 1.0–1.5 mm. long, *glabrous*, resin-atomiferous, columnar to truncate-turbinate.

DISTRIBUTION: Plants of the Atlantic and Gulf Coastal Plain of the Southeastern United States; occurring in wet pine barrens, cut-over pinelands, margins of pine barren ponds, gum-cypress woods, open swamps, borrow pits and ditches, roadside drainage pools and moist flatwoods; from the parishes of Louisiana east of the Mississippi River, through the more coastal counties of Mississippi and Alabama, the northern portions of Florida, and extending northwards in the Coastal Plain of Georgia and South Carolina into Brunswick County, North Carolina. (MAP 1)

REPRESENTATIVE SPECIMENS.—**Louisiana.** Orleans Parish: New Orleans, *Drummond 178* (TEX). St. Tammany Parish: vicinity of Covington, *Arsene 12186* (US). Tangipahoa Parish: 2 m. W. of Hammond, *Rose-Innes & Warnock 725* (GH, TEX). **Mississippi.** Hancock Co.: 8 m. W. of Bay St. Louis, *Rose-Innes & Warnock 21139* (TEX). Harrison Co.: Bay St. Louis, *Demaree 31701* (NCU). Jackson Co.: Ocean Springs, April 1892, *Skehan s.n.* (DUKE). Pearl River Co.: Millard, 17 March 1927, *Reed s.n.* (US). **Alabama.** Baldwin Co.: Point Clear, 2 March 1883, *Mohr s.n.* (US). Escambia Co.: Flomaton, 23 April 1898, *Baker s.n.* (F, US). Mobile Co.: Mobile, 26 April 1898, *Baker s.n.* (NY, POM). **Florida.** Baker Co.: 5 m. N. of McClenny, *Blanton for O'Neil 6461* (US). Bay Co.: bridge beyond Youngstown, 16 March 1937, *West & Arnold s.n.* (FLAS, PH). Bradford Co.: Lawtey, 25 March 1940, *Murrill s.n.* (MO). Calhoun Co.: 5 m. W. of Blountstown, *Jackson 314* (DUKE). Clay Co.: Hibernia, March 1869, *Canby s.n.* (DS, F, GH, MO, NY, PH, US). Duval Co.: wet pine barrens, 16–18 March 1882, *J. D. Smith s.n.* (F, GH, US). Franklin Co.: Apalachicola, *Bilt. Herb. distrib. ex Herb. Chapm. 3983* (GH, MO, NY, US). Holmes Co.: Ponce de Leon, 18 March 1937, *West & Arnold s.n.* (FLAS). Nassau Co.: Callahan, 15 May 1941, *Knight s.n.* (FLAS). Okaloosa Co.: 6 m. NW. of Fort Walton, *Tyson 585* (FLAS). St. Johns Co.: near St. Augustine, March 1884, *Brinton s.n.* (PENN). Walton Co.: near DeFuniack Springs, *Curtiss 6382* (BKL, DS, GH, MIN, MO, NY, UC, US). **Georgia.** Berrien Co.: Alapaha, *Lemon 226* (COLO, FLAS, MIN). Brooks Co.: 6 m. W. of Quitman, *Pyron & McVaugh 2183* (GH). Bullock Co.: near Statesboro, *Harper 2167* (F, GH, MO, NY, US). Calhoun Co.: about 2 m. SE. of Cordrays Pond, *Thorne & Muenscher 8020* (GA). Camden Co.: 12 m. E. of Folkston, *Pyron & McVaugh* 1455 (GA). Charlton Co.: about 2 m. W. of Folkston, *J. S. Harper 426* (NY). Dougherty Co.: 'tween Tiokee and Chickasawhatchee creeks, W. of Pretoria, *Thorne & Muenscher 9160* (IA). Early Co.: between Cedar Springs and Safford, *R. M. Harper 3638* (I, NY[b], MICH, PH, US[b]; not GH, MO, NY[a], US[a]). Lee Co.: about 1 m. S. of Smithville, *Eyles & Eyles 8033* (NCSC). Lowndes Co.: 3 m. E. of Valdosta, *Quarterman 499* (DUKE). McIntosh Co.: about 7 m. NW. of Darien, *Leeds 2837* (PH). Tift Co.: 8 m. SE. of Tifton, *Shepherd 111829* (DUKE). Toombs Co.: 7 m.

SE. of Lyons, *Cronquist 4690* (GA, GH, NY, US, WS). Ware Co.: Waycross, 18 April 1897, *Williamson s.n.* (PH). Wilcox Co.: in open woods at edge of bog, 2 May 1942, *Duncan 5056* (GA). Worth Co.: Sylvester, *Smith & Schulze 3703* (GA). **South Carolina.** Beaufort Co.: Hardeeville, March 1894, *Williamson s.n.* (PH). Berkeley Co.: 13 m. N. of Wando, 5 m. SSE. of Witherbee, *Duncan 5947* (GA, OKLA). Dorchester Co.: Summerville, 19 April 1897, *Githens s.n.* (PH). Florence Co.: in drainage pool, 5 m. S. of Effingham, Rte. 567, 21 April 1955, *Rock 567* (undistributed). Georgetown Co.: in roadside ditch with standing water 8–16″ deep, Jct. Rte. 521 & 17A, between Andrews and Georgetown, 23 April 1955, *Rock 601* (undistributed). Horry Co.: Myrtle Beach, *Weatherby & Griscom 16674* (GH, NY). Orangeburg Co.: Santee, 1 April 1838, (NY). **North Carolina.** Brunswick Co.: growing in open bog and gum-cypress woods, 3.5 m. from Longwood en route to Olympic, 24 April 1955, *Rock 591a* (undistributed).

Through the years the legitimate name for this taxon, *Helenium vernale* Walt., has been consistently misapplied to the preceding species *H. pinnatifidum* (Nutt.) Rydb. A simple check of the characters of the specimen in the Walter Herbarium at the British Museum, however, has shown that this is the species Walter had at hand and that *H. Nuttallii*, under which this species has been masquerading, is clearly a synonym. This misapplication has been reported by the author separately (RHODORA **56:** 311–317. 1956) and the details concerning the correct identity of Walter's *H. vernale* are not repeated here. The nomenclature and synonymy relevant to this taxon are self-explanatory once the identity of Walter's *H. vernale* is established, except for that covered in the following discussion.

When Nuttall established the genus *Leptopoda*, he described the only species known up to that time, *Leptopoda Helenium* Nutt. This taxon, however, has proved to be the same as Walter's earlier *Helenium vernale*, of which no mention was made by Nuttall. Shortly thereafter, Elliott (Sk. Bot. S. C. & Ga. 2: 445. 1823) substituted the use of *Leptopoda decurrens* MacB. in Ell. for Nuttall's *L. Helenium*. Elliott justified this action by stating: "As fimbriata, the name applied to one of these plants by Michaux is derived from a generic character applicable to both, and [*Leptopoda*] helenium not appropriate, I have taken the liberty of distinguishing these two species [*L. Helenium* Nutt. and *L. puberula* MacB. in Ell.] by the names given to them by Dr. Macbride; when many years ago he first pointed them out to me as distinct, though hitherto confounded." It was at this time that the second species of *Leptopoda* was

described, the *Leptopoda puberula* referred to in the above quotation. It was at this time, also, that the misapplication of Walter's *Helenium vernale* began. MacBride was convinced that Walter did not see or ever possess any specimens of *L. Helenium* (*L. decurrens*). Although Walter's herbarium has disproven Macbride's conviction, James Macbride contended that the plant Walter called *Helenium vernale* was the same as the species which Macbride was calling *Leptopoda puberula*. Elliott, when he published Macbride's names and descriptions, therefore listed *Helenium vernale* Walt. as a synonym of *Leptopoda puberula* MacB. in Ell. Apparently, however, no one has ever critically examined the specimens of *Helenium* in Walter's herbarium and this misapplication started by Macbride and Elliott has continued and been followed up to the present time.

In 1841, Nuttall elaborated upon his earlier work concerning *Leptopoda* and published the descriptions of three new species of *Leptopoda*. In this later work, Nuttall, moreover, was firm in his use of *Leptopoda Helenium* Nutt. for this species, *Helenium vernale*, and made no mention of either Elliott, Macbride or Walter. One of the three new species published in the work of 1841 was *Leptopoda denticulata* Nutt. Nuttall established this species on the basis that it differed from *L. Helenium* Nutt. in that the leaves were "linear-sublanceolate, denticulate" in *L. denticulata* rather than "leaves entire; radical oblong-lanceolate, denticulate" as in *L. Helenium*. Also, Nuttall held that the "flower" of *L. denticulata* was larger than that of *L. Helenium*. This study has revealed that there is no sensible discontinuity between the two leaf types and the head sizes valued by Nuttall as specific indicators. Indeed, there has never been any serious consideration of *L. denticulata* as a taxon by any taxonomist subsequent to Nuttall. Once this species became better known, the differing leaf forms, their degree of denticulation and the range of head sizes became accepted as part of the inherent variation of the species. However, it is to be noted that the pinnatifid form of the leaf so common in the preceding species, *Helenium pinnatifidum*, is of a relatively low frequency in this species.

Finally, in 1874, when Asa Gray transferred the species of

Leptopoda to *Helenium* he gave the name *Helenium Nuttallii* to this species and included within it *L. Helenium* Nutt., *L. denticulata* Nutt. and *L. decurrens* MacB. in Ell.

3. **Helenium Drummondii,** nom. nov.[6]

Leptopoda fimbriata T. & G. Fl. N. A. **2:** 387. (1842) non A. Eaton, Man. Bot. N. A. 275. 1829. Lectotype: Drummond 208, Texas (NY); syntype (TEX). Syntype: Leavenworth, East Florida (NY). Syntype: Leavenworth, Texas (GH).

Helenium fimbriatum A. Wood, Am. Bot. & Flor. 182. 1870. ? *nomen ambiguum.*

Helenium (Leptopoda) *fimbriata* A. Gray in E. Hall, Plantae Texanae 13, (no. 360). 1873. *nomen nudum.*

Helenium fimbriatum (Michx.) A. Gray, Proc. Am. Acad. Arts & Sci. **9:** 204. 1874. Synonym in part as to *Leptopoda fimbriata* T. & G. but excluding *Galardia fimbriata* Michx.

Perennial herb, the stem developing from a rosette formed the previous season from the seedling or as an offset from the short caudex; the caudex with coarsely fibrous roots and often with the persistent fibrous leaf bases of the prior rosettes. Plant erect, (1.9–) 4.7–5.4 (–6.0) dm. high, single-stemmed, often occurring in clusters, *unbranched and usually monocephalous*, occasionally with two heads and rarely with three. When the number of heads is greater than one, the secondary heads, arising from buds within the leaf axils, are formed at a later period than the terminal one and are decidedly later in flowering than the primary one, as well as being borne on shorter peduncles. Stem glabrous, sulcate and often anthocyanaceous below. Peduncle striate, *lanulose below the involucre*, becoming enlarged and fistulous beneath the involucre. Leaves glabrous, strongly uni-nerved, lateral nerves obscure, impressed-punctate, resin-atomiferous, becoming reduced in size and form upwards but usually not so as to appear scapose. Radical leaves usually intact and present, (4.0–) 9.0–20.0 cm. long, 3.5–5.5 (–9.0) mm. wide, being linear-lanceolate, elliptic-lanceolate to less frequently spathulate or oblanceolate; margin ranging from entire to repand, dentate (coarsely and remotely so) to pinnatifid; apex acute to acuminate; *the basal portion of the leaf tapering so as to form a petioloid structure* but expanding again at the base within the rosette so as to become somewhat clasping. Lower cauline leaves similar to the basal leaves, except not petioloid, usually decurrent except for the lowermost. Mid-cauline leaves becoming more reduced with each successive internode, *decurrent along the stem with manifest wings*

[6] Because of an imperfect understanding of the 1952 edition of the International Code of Botanical Nomenclature, the annotation labels placed on specimens of this species read: "Helenium Drummondii, sp. nov. in ed." Moreover, at the same a holotype and isotypes were designated. However, Article 72 (1956 ed.) indicates that only a new name is called for and the typification of this name remains the same as that for *Leptopoda fimbriata* T. & G.

that exceed 2 cm. in length. Uppermost leaves reduced to bracteate appendages, not decurrent, frequently toothed, linear-lanceolate, becoming more remote in disposition with increased position upwards. Involucre biseriate, with the outer series exceeding the inner; phyllaries lanceolate, 5.0–9.0 mm. long, 1.0–1.5 mm. wide at the base, apex acute, glabrate to glabrous, patent initially, becoming withered in age with or without becoming reflexed. Heads convex to depressed-hemispherical, 0.9–1.4 (–1.8) cm. high, 1.2–2.2 cm. broad; receptacle convex to hemispherical. Ray florets neutral; ligules yellow, 1.2–2.2 cm. long, cuneate to narrowly cuneate, 3–(4–) fid at the apex, pubescent to glabrate below, resin-atomiferous; achenes abortive and less than the length of the disk achenes. *Disk yellow;* disk floret fertile, pentamerous; corollas 5-lobed, 3–4.0 mm. long, glandular-pubescent on the lobes, resin-atomiferous, cylindric to cylindric-campanulate in outline with a short basal tube; pappus scales more or less oblong, 5–10 in number, 2.0–3.5 mm. long, the *body of the scale being deeply divided, one-half the total length of the scale or more, into many capillary segments,* the segments in turn being *crinkled or crimped at maturity,* the pappus scales often appearing silvery; *achenes hairy-pubescent* on the ribs, the hairs relatively long and rufous, achenes resin-atomiferous, columnar to truncate-turbinate, 1.0–1.5 mm. in length.

DISTRIBUTION: Plants of the Coastal Plain of northeastern Texas and southwestern Louisiana and possibly eastern Florida?; occurring in wet pinelands, swampy prairies, bogs, margins of ponds and wet grasslands. (Map 2)

REPRESENTATIVE SPECIMENS.—**Texas.** Hardin Co.: Sour Lake, *Palmer 13110 & 13114* (BKL, MO, TENN). Harris Co.: Houston, *Hall 360* (F, GH, MO, NY, POM). Houston Co.: E. of Grapeland, *Whitehouse 10634* (SMU). Jasper Co.: 3 m. NE. of Evadale, *Cory 52730* (COLO, DS, GH, NCSC, RS, SMU, US, WS). Jefferson Co.: S. of Beaumont, *Reverchon 3973* (GH, MO, SMU, US). Leon Co.: in edge of swampy ground, Oakwood, 10 May 1942, *E. C. Smith s.n.* (CS). Liberty Co.: Kountze, *Tharp 7302* (TEX). Newton Co.: 30 m. S. of Newton, *Winkler, York & Tharp 47184* (OKL, RM, RSA, TEX, UARK). Tyler Co.: Hyatt Bog, 16 m. S. of Woodville, *Cory 52711* (SMU). **Louisiana.** Calcasieu Parish: 20 m. W. of Lake Charles, 9 April 1936, *Penfound s.n.* (NO). **Florida.** No county indicated or determinable: *Treat s.n.* 1876 (PENN); *Leavenworth s.n.* (NY).

The nomenclatural discussion concerning this species, *Helenium Drummondii,* is in some aspects related to and a continuation of the discussion presented under *Helenium pinnatifidum.* In that discussion, it was pointed out that *Galardia fimbriata* Michx. is a name that was based on two different elements, *Helenium vernale* and *H. pinnatifidum.* It was demonstrated that *Leptopoda fimbriata* T. & G. (1842) is a later homonym of *Leptopoda fimbriata* (Michx.) A. Eaton (1829) and that Torrey and Gray's name is applicable to the present species, *Helenium Drummondii.*

In the year 1870, Alphonso Wood made the combination *Helenium fimbriatum* in The American Botanist and Florist at the time when he merged *Leptopoda* with *Helenium*. As stated previously (cf. discussion under *H. pinnatifidum*), Wood gave no direct reference to the basionym for this combination, be it *Galardia fimbriata* Michx. or *Leptopoda fimbriata* T. & G. or indirectly through *Leptopoda fimbriata* (Michx.) A. Eaton. As an indirect indication of the basionym involved, a comparison of the description provided by Wood for *Helenium fimbriatum* can be made with those listed above. On the basis of this comparison, Torrey and Gray's name seems to be indicated as the most probable basionym involved in the new combination made by Wood.

However, there are various other indirect means that can be marshalled against accepting Torrey and Gray's name as the basionym for Wood's combination. First and foremost of these is the very real possibility that Wood was adopting Torrey and Gray's description for Michaux's epithet, especially in view of Torrey and Gray's uncertainty as to the identity of *Galardia fimbriata* Michx. and the curious way in which they phrased the proposal for their own *Leptopoda fimbriata*. This is further borne out by the fact that the uncertainty concerning *Galardia fimbriata* involved only the question of which species of *Leptopoda* to which it applied. That *Galardia fimbriata* did apply to some species of *Leptopoda* has always been an accepted conclusion. Finally, the variation encountered in *Helenium pinnatifidum*—to which *Galardia fimbriata* does apply, in part—is such that it is possible to apply the description given by Wood for *Helenium fimbriatum* to certain specimens of *Helenium pinnatifidum*.

As another indication that *Leptopoda fimbriata* T. & G. may not be the basionym involved in Wood's combination, the fact that Wood did not recognize *Leptopoda fimbriata* T. & G. prior to 1870 is cited. In the Class-Book of Botany, first appearing in 1861 and in which Wood included the genus *Leptopoda*, no mention is made of Torrey and Gray's *L. fimbriata*. Various subsequent editions (or issues), although they contain corrections and additions, still did not indicate that Wood recognized *Leptopoda fimbriata* T. & G. Under such circumstances, one can hardly believe that Wood overlooked Torrey and Gray's

name or that it was accidentally left out in printing. It appears, rather, that it was left out deliberately. In the preface to his Class-Books, Wood states:

"From the multiplication of species and genera we have studiously refrained, believing that our books already contain more than Nature will warrant. In the case of any doubtful specimen, which might have served as the basis of a new species, or possibly genus, (had this been our aim), we have always inclined rather to the extension of the limits of some kindred group for its reception, having less apprehension of error in this direction than in the opposite, with all due regard for the permanence of true species. The same principle has compelled us to disallow the claims of many reputed species of the best authors."[7]

As supplementary circumstantial evidence against the acceptance of Wood's combination as a direct transfer of *Leptopoda fimbriata* T. & G., the description given by Wood for *Helenium fimbriatum* may itself be used. Wood's description is obviously not directly adopted from that provided by Torrey and Gray. Too many particulars are omitted. Rather, a round-about procedure involving the descriptions used by Chapman and Darby seems to be indicated. In addition, if Wood were copying directly from Torrey and Gray, the later homonym *Helenium puberulum* created by Wood to that of DeCandolle would stand out as a glaring error inasmuch as Torrey and Gray clearly list *Helenium puberulum* DC. as a Californian species in their Flora of North America. Finally, the distribution given by Wood for *Helenium fimbriatum* consists solely of "Florida," whereas Torrey and Gray emphatically indicate Florida and Texas as the distribution of their *Leptopoda fimbriata*. It was Wood's habit to give the entire range of a taxon, whenever it was available, even though this range extended beyond the province of his Floras.

In view of these indirect means, it is possible to raise a reasonable doubt concerning the basionym involved in the combination *Helenium fimbriatum* made by Wood. Moreover, no specimen

[7] Another indication that Wood was not strictly a copyist but did some kind of taxonomic research can be seen in his treatment of the combined genus *Helenium* in the American Botanist and Florist (1870). In this work, Wood revived the pre-Linnean generic name *Heleniastrum* [Mill.] which he used as a sectional epithet for the styliferous-rayed species of *Helenium*. This epithet had not been used by taxonomists since Miller's Gardeners Dictionary of 1739 and was not to be used again after Wood until 1891 when Otto Kuntze revived it as a substitute generic name for *Helenium*.

(either collected, annotated or seen by Wood) has been discovered that would indicate the taxon to which Wood applied the name *Helenium fimbriatum.*

In 1873, Bentham (Gen. Pl. **2** (pt. 1): 414. April), apparently unaware of Wood's work, suggested that *Leptopoda*, along with several other genera, be merged with *Helenium.* Bentham merely listed these genera to be merged, however, and did not make any formal transfer of the species involved. In the same year, Asa Gray published the beginning of a paper (Proc. Am. Acad. Arts & Sci. **8:** 631–661. May, 1873) which was "partly in the way of a commentary upon the recent most important revision of the order *Compositae* by Mr. Bentham in the second volume of Bentham and Hooker's *Genera Plantarum,* and partly the re-elaboration of certain genera, or the addition or reformation of species, chiefly such as have fallen in my way while engaged upon this portion of the Flora of California." In the following year (Proc. Am. Acad. Arts & Sci. **9:** 187–218. May, 1874), Gray published the continuation and the conclusion of the paper. It is in the later portion (p. 202–205) that Gray presents "An arrangement of the known species" of *Helenium.* At that time, ignoring Wood's previous transfers of 1870, Gray also transferred the species of *Leptopoda* to *Helenium.* In the 1874 paper, Gray refers to "*Helenium fimbriatum* Gray." This is followed by a description and these references: "—Gray in Hall, List, Pl. Tex. no. 360. *Gaillardia fimbriata* Michx. *Leptopoda fimbriata* Torr. & Gray, Fl. 2, p. 387.—"

Hall's Plantae Texanae—subtitled "A List of Plants Collected [by Elihu Hall] in eastern Texas in 1872 and Distributed to Subscribers"—was published at Salem, Mass. in 1873. It consists solely of a list of plant collection numbers and their determinations. Presumably, these determinations were made by Asa Gray. Number 360 in this list is "*Helenium* (Leptopoda) *fimbriata*" and number 361 is "*Helenium* (Pseudo-Helenium) *nudiflorum* Nutt." The parenthetical expression "(Leptopoda)" in no. 360 is an ambiguous reference. It could be either a reference to the genus *Leptopoda,* in which case no direct reference is made to either of the two homonyms of *L. fimbriata* as the basionym for this combination by Gray, or it could represent the sectional epithet LEPTOPODA used by Torrey and Gray

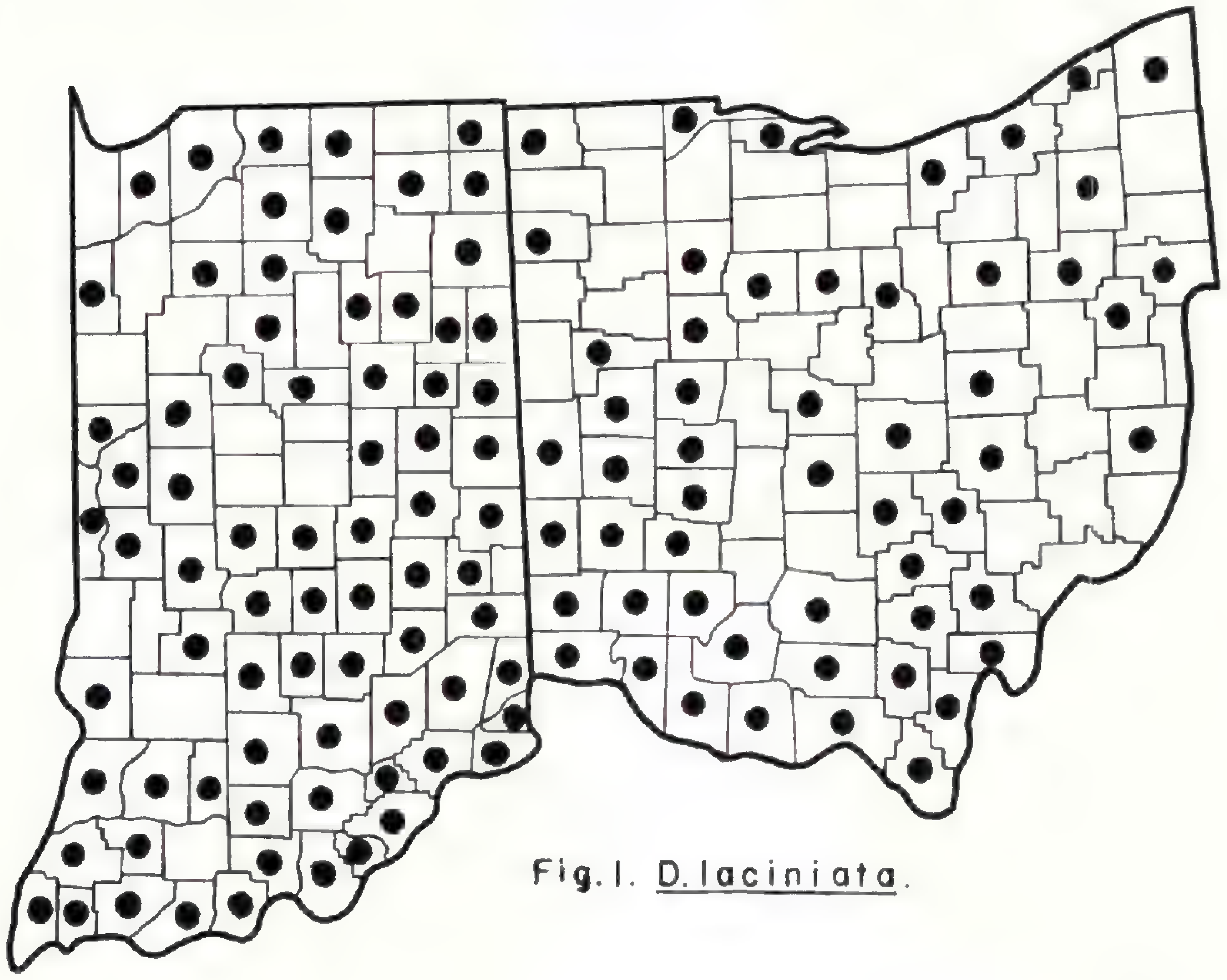
in 1842 and which Gray was to use in his 1874 treatment of *Helenium*. Certainly, "(Pseudo-Helenium)" is not a generic reference but represents the sectional name used by Torrey and Gray in *Leptopoda* in 1842.

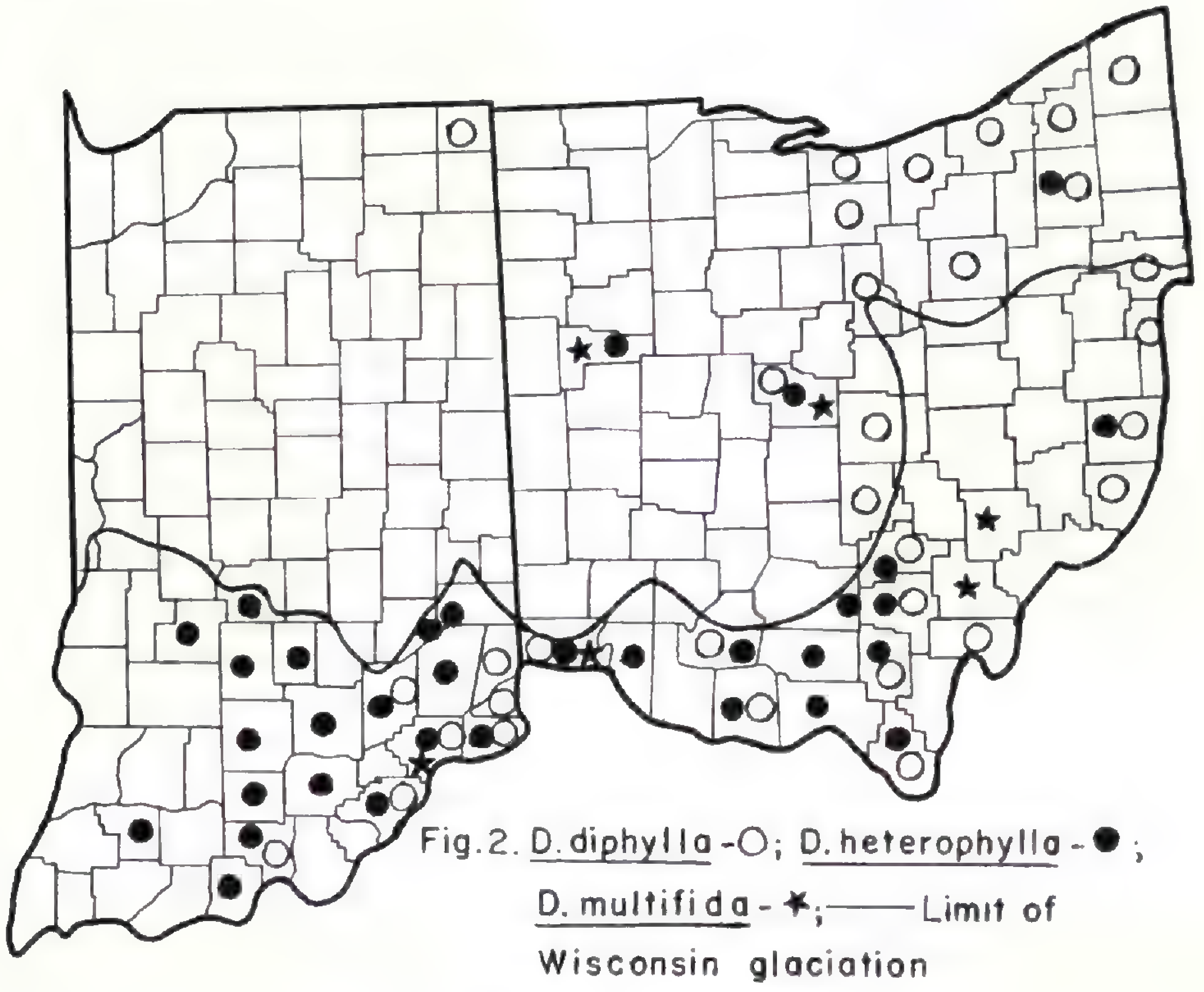
Considering that Hall's publication with Gray's determinations was published during the interim between the 1873 and 1874 papers of Gray, it appears that these determinations by Gray in Hall's list must necessarily be based on Gray's published work of 1873–74. Under these conditions, it then appears best to consider the name "*Helenium* (Leptopoda) *fimbriata*" Gray in Hall, Plantae Texanae, to be a *nomen nudum*, inasmuch as a description is lacking and there is no clear indication of a basionym. In that case, Gray's paper of 1874 would constitute the validation of the name used in Hall. According to the synonymy cited by Gray at that time (1874), the epithet *fimbriata* would then be derived from the prior name, *Galardia fimbriata* Michx. and not from the later *Leptopoda fimbriata* T. & G. The citation of Michaux's *Galardia fimbriata* in the synonymy of this species by Gray in 1874 apparently represents a change of opinion by Gray over that which he held with Torrey in 1842, when they cited Michaux with uncertainty and doubt.

On the other hand, however, if one interprets the "(Leptopoda)" reference of Hall's no. 360 to be an implied reference to *Leptopoda fimbriata* T. & G., then the transfer made by Gray would be either a later homonym or a superfluous repetition of the prior *Helenium fimbriatum* of Alphonso Wood, depending on whatever the basionym of Wood's combination is (an indecipherable quality). In any case, whether Gray's combination dates from 1873 or from 1874, it is illegitimate for there is no question that Wood's combination is validly published and legitimate in terms of priority, regardless of how ambiguous it may be.

(*To be concluded*)

Dentaria in Indiana and Ohio.—In an earlier paper on the genus *Dentaria* a distribution map was given for each





Distribution of *Dentaria* species in Indiana and Ohio.

of the eastern North American species.[1] It was pointed out to the writer that he had overlooked some important herbaria that would have given a better picture of the species as they occur in Ohio and Indiana. Since *D. heterophylla* and *D. multifida* reach their northern limit in these states, and *D. diphylla* occurs with diminished frequency, it is rather important to know the range of the species in these states. Additional herbarium material has been examined from Ohio State University, Columbus, Ohio; Butler University, Indianapolis, Ind.; Indiana University, Bloomington, Ind.; and Wabash College, Crawfordsville, Ind. The data from these have been added to that of the herbaria listed in the previous paper, and the distribution, as now known, of the species in these states is plotted on the accompanying maps.

The wide ranging species, *D. laciniata*, has been collected over most of Ohio and Indiana (fig. 1). *D. diphylla* (fig. 2) in Ohio is restricted to the eastern half of the state and a few of the southern counties. In Indiana it occurs in some of the southern counties and in one county in the north, Steuben. This is considered to be a southern extension from Michigan where it has been collected in two bordering counties.

It is interesting to note that *D. heterophylla* (fig. 2) extends into the area of Wisconsin glaciation[2] in only three counties of Ohio, viz., Auglaize, Delaware, and Portage, and that *D. multifida* (fig. 2) has been collected in the first two of these counties. Elsewhere in Indiana and Ohio, as nearly as can be determined from the information on herbarium labels, these species may come close to, but do not cross into the Wisconsin glaciated area.

The distribution of *D. multifida* in Indiana as given here does not agree with that given by Deam in his "Flora of Indiana" p. 499, map 1028. I have been unable to locate in any of the herbaria any specimens other than those for Jefferson County.—

F. H. Montgomery, Ontario Agric. College, Guelph.

[1] Rhodora 57: 161–173. (1955)

[2] Extent of Wisconsin glaciation from:

Leverett, F., and F. B. Taylor, 1915. The pleistocene of Indiana and Michigan and the history of the Great Lakes. U. S. Geol. Survey Mon. 53.

Leverett, F., 1902. Glacial formations and drainage features of the Erie and Ohio basins. U. S. Geol. Survey, Mon. 41.

New Plant Records: Illinois and Indiana.—The following collections represent the first records of these taxa from Illinois or Indiana. Specimens are deposited in the Herbarium of the Illinois State Natural History Survey at Urbana (ILLS) and/or the Herbarium of the Chicago Natural History Museum (F).

Physalis ixocarpa Brotero. This ground-cherry was collected in northwest Indiana in disturbed, sandy soil east of Clark Road, about 1 mile north of highway 12, Gary, Lake County, July 31, 1955, *Thieret 1514* (F).

Verbascum virgatum Stokes. A number of plants of this species, growing up to seven feet tall, were observed with *Verbascum thapsus* and *V. blattaria* and collected in the railroad yard at Mounds, Pulaski County, Illinois, July 25, 1956, *Evers 51500* (ILLS), *Thieret 2085* (F). The discovery of this species in Illinois raises to five the number of members of *Verbascum* reported to have been collected in the state.

Liatris squarrosa (L.) Michx., forma **alba,** f. nov., a typo differt floribus albidis.—Bluff top, Belle Smith Springs, Pope County, Illinois, July 24, 1956, *John W. Thieret 2031*, TYPE, in Herb. Chi. Nat. Hist. Mus.; July 24, 1956, *R. A. Evers 51400*, isotype in Herb. Ill. Nat. Hist. Surv.

This white-flowered form was found growing with plants showing the usual phlox-purple color.—Robert A. Evers and John W. Thieret, Illinois State Natural History Survey and Chicago Natural History Museum.

Susan McKelvey's History: an appreciation with some incidental *inquirendae et addendae.*[1]—"The book lies on our desk as a testimony of the best of human endeavour," wrote Dr. H. J. Lam in another connection, "and it commands our admiration written as it is in the spirit of reverence for every witness of good-will through the ages." This was said of Mrs. Van-Steenis-Kruseman's *Cyclopedia of botanical exploration in Malaysia* (1950), but is relevant here as well. We return to such books as veritable libraries of information. That they may (and will) have *lacunae* is known first to the authors, who have long delayed their appearance to avoid them. Then upon their publication, like turning the hour-glass end for end, desk copies are marked with the additions and corrections that will accrue toward the future revision. I have reviewed this book-of-the-century in brief commendatory remarks in another place (Scientific Monthly **84:** 161. Mar. 1957); here it may prove useful to record precise points that came to notice in a critical reading.

This book is first a human document, for though its 1184 pages are

[1] *Botanical Exploration of the Trans-Mississippi West, 1790–1850.* By Susan Delano McKelvey. Arnold Arboretum, Jamaica Plain, Mass. 1955. pp. xl, 1144. maps. $25.

history told by decades the telling is frequently interrupted for an aside or incident in the very writing of the book. For this reason the account is rather more narrative than encyclopedic. From an intimate field experience in the American West, pursuant to a monographic study of the genus *Yucca*, Mrs. McKelvey writes this omnibus volume with verve and verdict. Books of this character have a special fascination for readers like the late Joseph Grinnell who remarked to me on one occasion that he first read the footnotes and if they proved tasty trimmings from the main dish then he would try the textual entree. Books like this send us to the reference shelf or to some arcane pamphlet on the chance that the author missed an ingredient long carried in our consciousness of history.

This reviewer has discovered the clue value of checking ships' registries in following up historical incidents. The index to Mrs. McKelvey's history includes a list of the ships' names appearing in its pages but I find some have been missed in the index and, for its fuller reference use, I'm listing below the complete roster, with additions italicized and the page references added in parentheses:

Activa
Alert
Antelope
Arauzaza
Assiniboine
Astrolabe
Atrevida
Belle
Blonde
Blossom
Bolivar (p. 717)
Bounty
Chatham
Columbia
Columbia Rediviva
Cowlitz (p. 717)
Cyane
Descubierta
Discovery
Dryad
Eagle
Flora
Flying-Fish
Ganymede
Halcyon
Hannah Elizabeth
Herald
Heros
Isabel
J. M. White
Jenny
Joven Guipuzcoana
Juno
Juno, H.M.S.
La Boussole
Maria
Maryland (p. 718)
Modeste
Nadeschda
Neva
Ninfa (p. 717)
Pandora (p. 967)
Peacock
Pilgrim
Porpoise
Prince of Wales (H.B.C.)
Princess Royal
Rasselas (p. 426)
Relief
Rurick
Russisloff
San Jacinto (p. 685)
Sarah and Elizabeth
Savannah
Sea-Gull
Starling
Sulphur
Sultana
Tonquin
Trent (p. 685)
United States
Unona
Vancouver
Vincennes
Western Engineer
William and Ann
Yellowstone

The word *Lupinaster* appearing on page 695 refers to the subgenus of *Trifolium* of that name and does not represent a mistake for 'Lupin' and 'Aster' as suggested in footnote 7.

Four personal names were missed in the compilation of the index which might be of some reference value, viz., Sellow, Friedrich (1789–1831), p. 557; Freyreiss, Georg Wilhelm (1789–1825), p. 557, which appears as

"Neircriss"; Cuming, Hugh (1791–1865), p. 749; and "Pierce" must refer to R. T. Pince of Exeter (?), p. 771.

The following miscellaneous notes are arranged in approximate chronological order:

(1) 1792: Jose Longinos Martinez (d. 1803), mutineer on the Royal Botanical Expedition to New Spain, visited Santa Catalina Island in 1792. Rickett gives the account of the Mexican travels of Longinos Martinez (Chron. Bot. **11:** 46–54 *et passim.* 1947) but overlooked Leslie Byrd Simpson's study entitled *California in 1792: the expedition of Jose Longinos Martinez* (San Marino, 1938), which was reviewed by J. W. Olmstead (Pac. Hist. Rev. **17:** 337. 1948). Neither Colmeiro (1858) nor E. W. Nelson (1921) mention Longinos Martinez in their accounts of Mexican botanical explorers. "Although Longinos' botanical and other natural observations have now only an antiquarian interest," Simpson remarks, there is a considerable body of botanical commentary, without accompanying specimens, from Baja California and the vicinity of San Diego. Unfortunately Prof. H. S. Reed, who provided the identifications for Simpson's edition of Longinos' journal, did not know Mexican plants and exercised little imagination as to what species were in fact alluded to. For example, the tree mallow, *Lavatera assurgentiflora*, is probably described when Longinos Martinez writes, "the common apothecary's mallow, which was not known in those countries, has been propagated from some seeds which were sent mixed with others—so much so that it is very difficult each year to clear it out. It grows with such vigor that because of it one cannot walk in the immediate vicinity of the missions or through certain grainfields. Each plant looks like a small tree." It is unfortunate that this first visit to Santa Catalina Island by a naturalist passed into history without herbarium record.

(2) 1806–08: Frederick Pursh's part in describing the Lewis and Clark plants, the delays incident to this whole unhappy chapter attendant on Prof. Benjamin Smith Barton's disaffection, his patronage by Bernard M'Mahon, and his employment by Dr. David Hosack at the Elgin Botanic Garden, have been sketched by the reviewer (Proc. Amer. Philos. Soc. **96:** 599–628. 1952). It is understandable that the chapter in Mrs. McKelvey's history was written prior to the appearance of this paper.

(3) 1837: The French frigate *La Vénus*, under command of Admiral Abel du Petit-Thouars, touched at Monterey, California, October 18th and departed the following November 14th. Adolphe Simon Neboux, surgeon on *La Vénus* was surely responsible for the botanical and zoological collections made. Literature on this expedition is limited but the late T. S. Palmer considers Neboux (Condor **20:** 114–116. 1918), also Grinnell (Univ. Calif. Publ. Zool. **38:** 319–320. 1932), whereas Lasègue accounts for Thouars himself (pp. 385–386) and John Thomas Howell adds a recent note (Leaflets West. Bot. **1:** 189–191. 1935).

(4) 1843: Audubon's collecting expedition up the Missouri River is importantly covered by John Francis McDermott's book *Up the Missouri with Audubon, the journal of Edward Harris* (Norman, 1951). Isaac Sprague's part on this expedition as artist and general aid interests us for his later career as botanical illustrator in the employ of Asa Gray. That Sprague did sketch plants on this Missouri River journey is quite clear from Harris's entry of July 18, 1843, when he wrote, "I found a few days ago some fine specimens of the small yucca of this country in flower. We soon found

them and pulled up one of the roots to carry home for Sprague to draw" (p. 143). McDermott is our best source for Sprague at present and "hopes presently to publish" his diary kept on this interesting journey, the last important one in Audubon's full life. O. A. Stevens summarized the botanical aspects of the expedition in a generally overlooked paper, "Audubon's journey up the Missouri River, 1843," mutilated by the editor but provided with a long list of corrections by Prof. Stevens (N. D. Hist. Quart. **10:** 61–82. 1943). Stevens provides identifications for the plant species Sprague drew for the backgrounds of Audubon's zoological drawings.

(5) 1849: Parry's classmate from Union College and the personal physician of Leland Stanford, Dr. Jacob Davis Babcock Stillman (1819–1888), merits consideration in the early history of California botany. Stillman arrived in San Francisco on August 5, 1849, began collecting plants almost at once, and for the next forty years wrote to his cronies Torrey, Gray, and Parry, of his discoveries incident to vacations about the state. Judging from the charming stories that he contributed to the *Overland Monthly* and from the prose of his evidently little-known book *Seeking the Golden Fleece* (San Francisco, 1877), Dr. Stillman must have been a delightful person to know. A sympathetic biography which would include liberal quotations from his writings is due (cf. Ewan in *A Century of Progress in the Natural Sciences* (San Francisco, 1955) 6, 60).

(6) 1849: Another physician, Dr. Timothy Langdon Andrews (1819–1908), came to San Francisco in November, 1849, but soon moved to Monterey and is best known for his botanical collections made in the vicinity which he sent to Torrey and Gray. The summer trip of 1850, when he botanized with the Englishman William Lobb, collector for the nursery firm of Veitch in California and involved in the history of the Big Tree, was a pioneer venture into the Santa Lucia Mountains, though they had been briefly visited by Douglas and Hartweg.

(7) 1850: Though the plant collections of Thaddeus A. Culbertson made on the upper Missouri were unimportant for novelties, the description of the country traversed as recorded in his journal provides primary ecological data. A new edition of Culbertson's journal, based on four sources, has recently been published by J. F. McDermott (Bur. Amer. Ethnol. Bull. **147:** i–viii, 1–164. 1952); this is not mentioned by Mrs. McKelvey. Culbertson's collections were made chiefly about the mouth of the Yellowstone and T. C. Porter reported their names but from the imperfect condition of the specimens his list is provisional. J. W. Blankinship evidently did not see Culbertson's collections, though he correctly surmised their presence in Porter's herbarium, now at Philadelphia Academy.

Joseph Sabin closed his monumental bibliography of Americana with the words that the historian Gibbon had used before him: "It was among the ruins of the Capitol that I first conceived the idea of a work which has amused and exercised near twenty years of my life, and which, however inadequate to my own wishes, I finally deliver to the curiosity and candor of the public." In the great tradition Sabin's and McKelvey's *opera* were both printed by the excellent and celebrated Southworth-Anthoensen Press of Portland, Maine. Both are enduring although different monuments.—

Joseph Ewan, Tulane University.

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THE NEW ENGLAND BOTANICAL CLUB

Vol. 59 August, 1957 No. 704

STUDIES IN THE HIPPOCASTANACEAE, IV. HYBRIDIZATION IN AESCULUS

JAMES W. HARDIN

THE topic of hybridization is of prime importance in the study of the genus *Aesculus*, for much of the confusion concerning the concept of species and the problem of identification of the buckeyes in eastern North America has been due to the mongrel forms so often encountered in the natural populations and gardens. As early as 1869, Loudon stated:

"... the truth is, that the different kinds of *Aesculus* and *Pavia* cross-fecundate so freely, and seedlings vary so much, that there is no limit to the number of varieties that might be produced. The great error (because it creates so much confusion in the nomenclature) consists in giving these varieties to the world as species."

Hybridization in the buckeyes involves only five of the fifteen species: *Aesculus hippocastanum*, and the four species of *Aesculus* section *Pavia* (*glabra*, *octandra*, *sylvatica* and *pavia*). *Aesculus parryi* of Baja California and *A. californica* of California are each geographically isolated and have not been found to hybridize, even under cultivation. *Aesculus parviflora* of Georgia and Alabama grows with *A. pavia* and *A. sylvatica* but does not hybridize with either. Its flowering period is two to four weeks later than either that of *A. pavia* or *A. sylvatica*, which apparently would serve as an effective seasonal or temporal isolation barrier. On the other hand, the fact that *A. parviflora* belongs to a different and distantly related section of the genus from *A. pavia* and *A. sylvatica* may explain the complete barrier to hybridization.

The only intersectional hybrid is *A. carnea* Hayne, which is an allopolyploid (n = 40) resulting from the cross between *A. hippocastanum* and *A. pavia*. *Aesculus plantierensis* André is a sterile backcross (n = 30) between *A. carnea* and *A. hippocastanum*. Both of these are garden hybrids and have been studied cytologically by Skovsted (1929) and Upcott (1936).

Many hybrids involving the sympatric species of section *Pavia* have been recognized, described, and given specific epithets. Both the hybrids arising under cultivation and the forms found in the natural populations will be discussed.

Many of the hybrids which have been given names represent forms which have arisen in various botanical gardens of Europe and America. Of the six possible hybrid combinations between the four species in section *Pavia*, all but two, *A. octandra* × *sylvatica* and *A. glabra* × *sylvatica*, have been previously described in the literature. The latter is still to be identified and there is no reason why it should not appear in cultivation.

Some hybrids involving three parental species have been given names. The exact crosses involved are unknown but it is possible occasionally to identify the parent species to which the hybrid is most nearly referable on the basis of all characteristics.

Johnson (1939) lists many of these cultivated hybrids, with short notes concerning their place of origin. It should be understood that in almost every case the parents of these hybrids have been determined from a study of comparative morphology. Although this is a sound criterion and there has been additional circumstantial evidence from the gardens as to the identity of the parents, none of the crosses was actually made experimentally. The significance of these hybrids arising under cultivation is that they match perfectly the putative hybrids found in the field, and therefore serve more or less as test crosses.

Since F_1 hybrids are not commonly used in horticulture, and none forms a distinct population in nature, formulae instead of specific epithets are used in all cases. The binomials would become especially confusing since introgression is so prevalent, as indicated below.

Intermediate forms between species are often encountered in the field as well as in herbaria, and the interpretation of these intermediate forms is sometimes difficult. The major question

is just what the intermediate forms mean. They may be the result of introgression between distinct species, or an ancestral gene pool in which sympatric speciation is going on at the present time. Anderson (1953) has described a number of tests by which the distinction can be made between introgression and the gene pool hypothesis. The significant points in these five tests which indicate introgression are: 1) the loose association of variables characteristic of the variation pattern in artificially produced hybrids and backcrosses; 2) the introgressants found in the floristically newer or disturbed areas; 3) sterility, if any, showing up in the intermediates; 4) ability to predict, by the method of extrapolated correlates, the introgressing species; and 5) the similarity of experimental hybrids and backcrosses with the putative hybrids found in the field. In accordance with these five criteria, it is concluded that the intermediate forms found in *Aesculus* populations are the result of sympatric introgression. Much of the evidence in favor of this conclusion has been derived from the analysis of populations using the techniques developed by Anderson. Additional evidence is the high percentage of abortive pollen found in the intermediate forms, the similarity with hybrids arising in cultivation, and the prevalence of hybrids in disturbed habitats.

For an analysis of introgression in the buckeyes, I took random samples of twenty to fifty specimens each, from over thirty populations throughout the range of section *Pavia*. Each specimen consisted of a twig with a mature inflorescence and at least three or four leaves, and was selected from a mature part of the tree or shrub. In every case the entire population was briefly surveyed to obtain an idea of size and the habitat differences; following this the specimens were taken from along a transect through the population, and more or less equally spaced so that the specimens represented the entire length of the transect. Since the shrubby species are occasionally clonal by root sprouts, the spacing was necessary to eliminate the possibility of collecting more than one specimen from each clone.

The analysis of populations of "pure species," hybrid swarms, and those in which hybridization was suspected, was made by the use of pictorialized scatter diagrams as described by Anderson (1949, 1953). After determining the characters to use in this

analysis, the diagrams or graphs were plotted and grouped according to the species crosses. Each of these crosses will be discussed individually. The explanations of the symbols used for the characters are given with the diagrams.

During the preparation of the systematic treatment of the *Hippocastanaceae* in America, about 5000 herbarium specimens were examined and annotated. A word of explanation is in order concerning the method of annotating the hybrid forms. Since introgression is widespread in the populations of eastern United States, it is rare that a specimen taken from a wild population is exactly intermediate between two species, i. e., the F_1 hybrid. Hybrids are more likely to represent backcrosses or various other recombinants. Usually such a backcross or recombinant can be referred to the parental species to which it is most nearly referable on the basis of all characters.

The specimens most nearly intermediate and which could not be placed with one or the other parent were annotated as "species A" × "species B"—the names in alphabetical order. The backcrosses and recombinants were annotated as "species A" (× "species B"), indicating that the specimen was most nearly referable to "species A" (which was probably the backcross parent), and that "species B" contributed the gene minority. There is some objection to this way of annotation, but as yet no other entirely satisfactory system has been proposed.

The citation of specimens is limited here to only one per county.

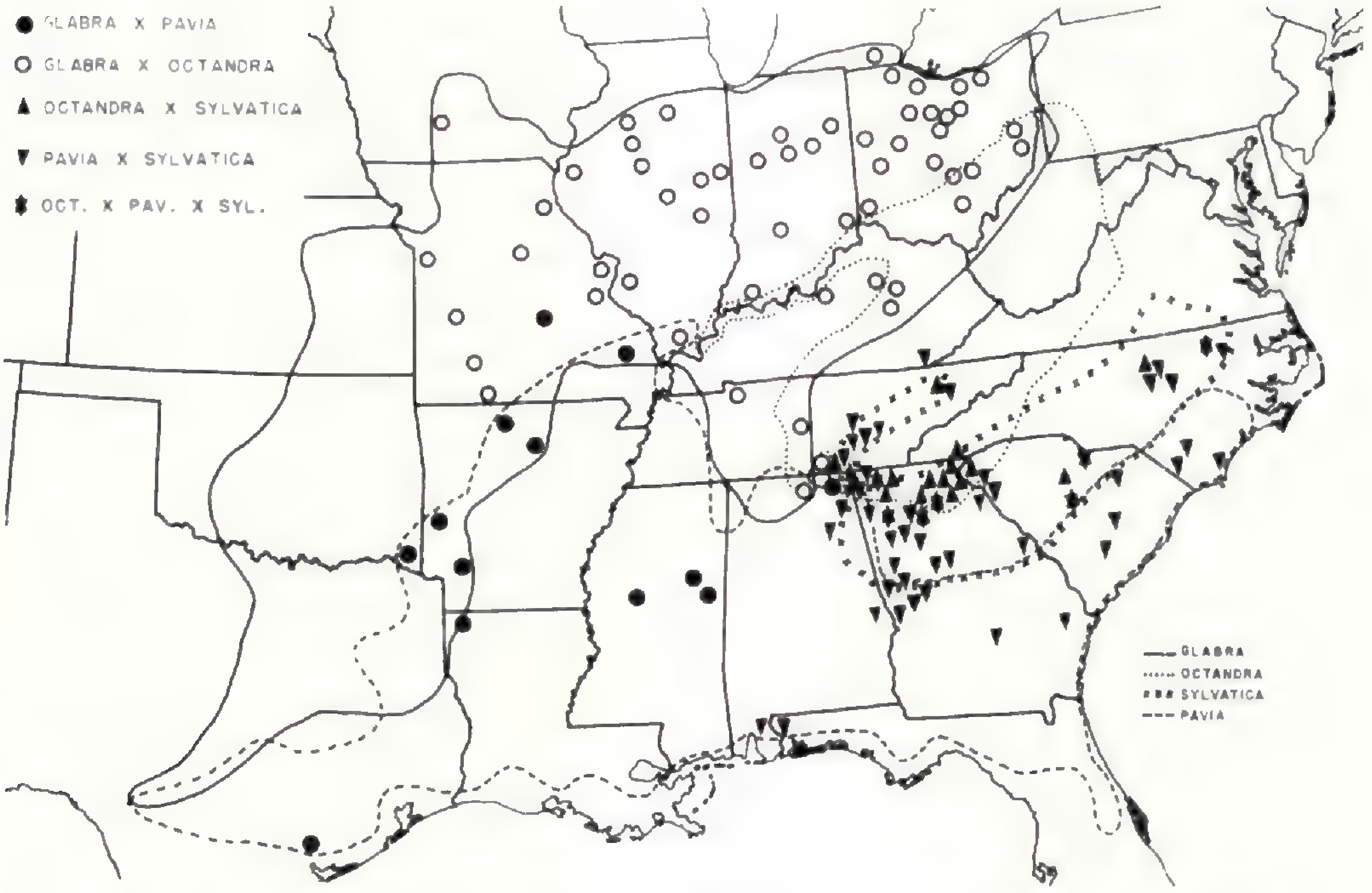
Aesculus glabra × octandra

Aesculus marylandica Booth ex Kirchner, in Petzold and Kirchner, Arb. Muscav. 168. 1864.

Aesculus glabra forma *marylandica* Koehner ex Schelle, in Beissner et al., Handb. Laubh.-Ben. 322. 1903.

Intermediates between *A. glabra* and *A. octandra* may be recognized by their exserted stamens, stipitate glands on the pedicel and perianth surfaces, greater differences between upper and lateral petals than are found in *A. glabra*, and the irregularity of spines on the ovary wall.

A few F_1 hybrids have been found; most of the intermediates, however, represent backcrosses or various recombinants. Since intermediates are detected by floral characteristics only, some



Map 1. Distribution of hybrids in relation to the ranges of the species.

sterile specimens annotated and cited as *A. glabra* may actually be *A. glabra* (× *octandra*), which is very common north of the Ohio River, as shown in Map 1.

Aesculus × *arnoldiana* Sarg. (Jour. Arn. Arb. **5**: 42. 1924.), occasionally cultivated in North America and Europe, represents a cross between *A. glabra* and the hybrid of *A. octandra* and *pavia*, or at least contains the characteristics of these three species, with *A. glabra* as the most apparent. According to Sargent this arose in the Arnold Arboretum about 1900.

One very interesting feature in the hybrids between *A. glabra* and *A. octandra* is the nature of the spines on the ovary wall. The effect of crossing a spiny-fruited type (*A. glabra*) with a smooth type (*A. octandra*) does not always result in the entire ovary being either spiny or smooth, or intermediate, but rather there is an unusual mosaic of spines on the wall—an irregularity which appears like sectorial chimeras in the pericarp. Particularly in the F_1 hybrids, only one side on the immature ovary wall will have the stipitate glands (which develop into the spines on the pericarp), or one single row of glands from top to bottom, or a number of small glandular sections separated by smooth areas over the wall.

This "irregularity phenomenon" seems to occur when parents differ sharply in one or more characters. These characters will then be irregularly and asymmetrically expressed in the hybrid. Such irregularity has been described in a number of ferns (Wagner, 1954, 1956; Wagner and Hagenah, 1954).

Specimens examined.—**Alabama:** Madison Co., 8 May 1881, *C. Mohr* (a)· **Illinois:** Champaign Co., *F. C. Gates 1508.1* (mich); Coles Co., *G. N. Jones 11143* (ny, uc); Hancock Co., 1 May 1844, *L. B. Mead* (mo, ny); Johnson Co., *E. J. Palmer 14971* (a, us); LaSalle Co., *J. W. Huett* (gh); Macon Co., *A. Gleason 281* (gh); Peoria Co., May 1890, *F. E. McDonald* (uc); St. Clair Co., 29 Apr. 1897, *H. Eggert* (ny); Stark Co., 15 May 1898, *Virginius H. Chase* (mo); Tazewell Co., May 1889, *McDonald* (gh); Vermilion Co., *Gates 1468* (us). **Indiana:** Cass Co., *C. C. Deam 19381* (a); Dearborn Co., *Deam 5691* (mo); Grant Co., *Hardin 673* (ga, mich, ncsc); Howard Co., *R. C. Friesner 15066* (gh, mo, ny, uc); Monroe Co., *M. E. Springer 789* (ga, tex); Tippecanoe Co., 3 May 1912, *L. O. Overholts* (mo); Warrick Co., *Deam 27087* (gh, ny); Wells Co., *Deam 758* (ny). **Iowa:** Madison Co., *Ada Hayden 7145* (mo). **Kentucky:** Bullitt Co., *P. A. Davies 249* (gh); Clark Co., *R. E. Horsey 1034* (a); Fayette Co., Apr. 1834, *R. Peter* (gh); Madison Co., *Horsey 1072* (a). **Michigan:** Lenawee Co., *Hardin 675* (ga, gh, mich, ncsc). **Missouri:** Boone Co., *F. Drouet 1901* (gh); Greene Co., *Hardin 667* (ga, gh, mich, ncsc); Marion Co., *J. Davis 1462* (a, uc); Jackson Co., *Bush 125* (a, gh, ny, us); Jefferson Co., 18 Apr. 1869, *Eggert* (ny, us); St. Clair Co., *Bush 13276* (a, mo); St. Louis Co., *Hardin 670* (ga, gh, mich, ncsc); Taney Co., *Bush 4517* (a, mo). **Ohio:** Ashland Co., *Hardin 695* (ga, gh, mich, ncsc); Belmont Co., *Hardin 690* (ga, gh, mich, ncsc); Crawford Co., 14 May 1897, *Kellerman* (os); Cuyahoga Co., May 1895, *G. B. Ashcraft* (ny); Fairfield Co., *Horsey 217* (a); Franklin Co., *Horsey 224* (a); Hamilton Co., *C. G. Lloyd 491* (mich, us); Harrison Co., *Hardin 694* (ga, gh, mich, ncsc); Logan Co., 9 May 1902, *Kellerman* (os); Lorain Co., 21 May 1904, *F. O. Grover* (os); Lucas Co., *Horsey 563* (a); Mercer Co., 12 May 1906, *S. E. Horlacher* (os); Miami Co., 5 May 1883, *H. A. Young* (gh); Morrow Co., 20 Jul 1901, *Kellerman* (os); Perry Co., Apr 1941, *F. Clean* (os); Richland Co., *Horsey 475* (a); Sandusky Co., 2 Jun 1881, *R. P. Hayes* (os); Vinton Co., 10 May 1901, *Kellerman* (os); Wyandot Co., 10 May 1901, *T. A. Bonser* (os). **Tennessee:** Franklin Co., 5 May 1898, *Eggert* (mo, ny); Rutherford Co., *Sharp et al. 11493* (tenn); Stewart Co., *A. W. Jobe 1823* (tenn).

The population in Vinton County, Ohio (Fig. 1) represents "pure" *A. octandra*, with the variation in size of flowers probably due to environmental conditions. The collections were made from large trees growing along a slope in a mixed mesophytic forest. Collections from Belmont County, Ohio, were taken from scattered trees and shrubs along a stream, through an open pasture, and to the edge of a beech-maple-buckeye woods, which had been lumbered recently. The population shown in Fig. 2 represents trees of *A. octandra*, with some influence from

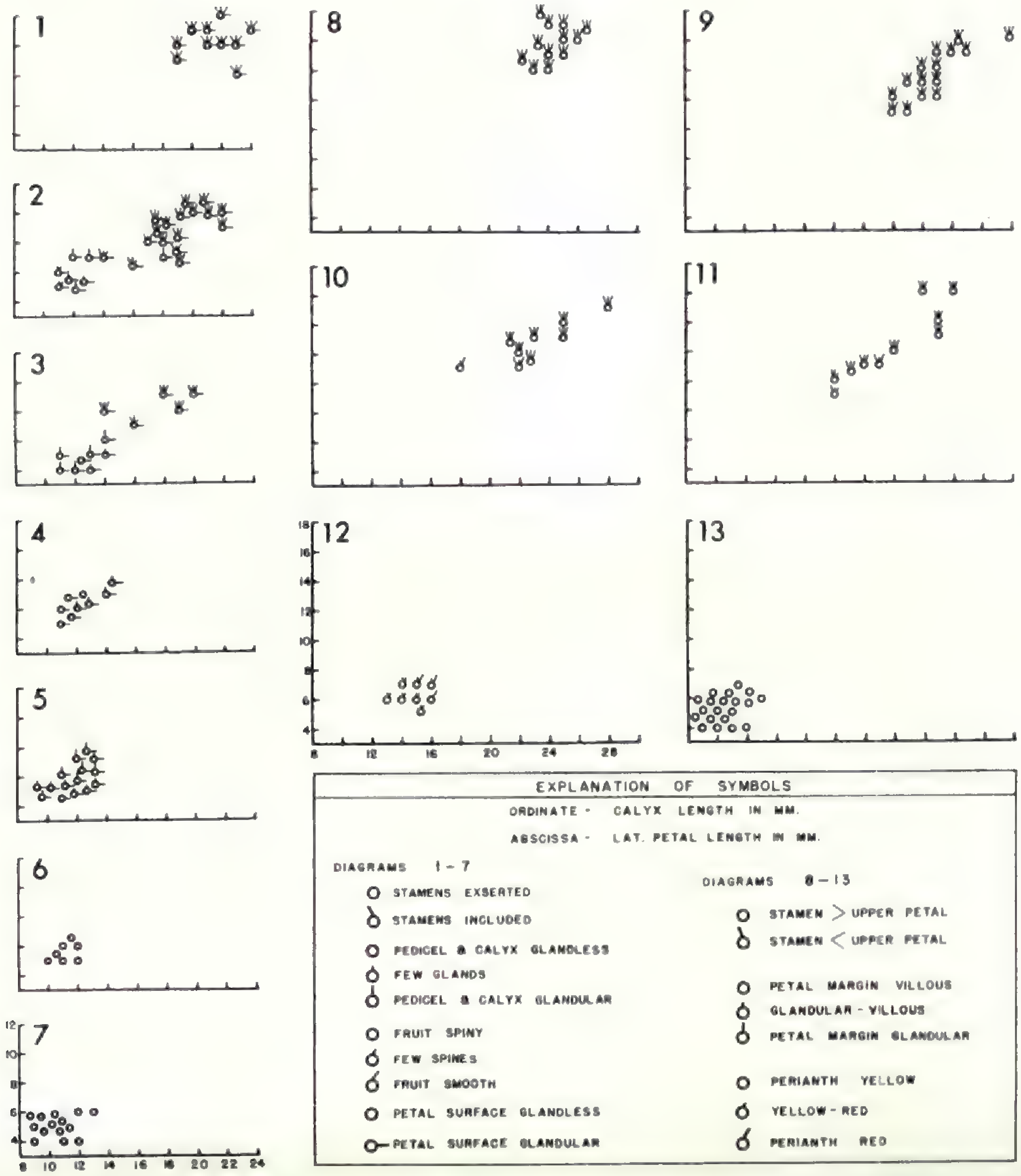


Fig. 1–7. Pictorialized scatter diagrams showing introgression between *A. glabra* and *A. octandra*. 1, *A. octandra* (Vinton Co., Ohio; Hardin 680). 2, *A. glabra* × *octandra* (Belmont Co., Ohio; H. 690, 691). 3, *A. glabra* × *octandra* (Belmont Co., Ohio; H. 692). 4, *A. glabra* (× *octandra*) (St. Louis Co., Mo.; H. 670). 5, *A. glabra* (× *octandra*) (Lenawee Co., Mich.; H. 675). 6, *A. glabra* (Guernsey Co., Ohio; H. 693). 7, *A. glabra* (Ark. and Mo.; H. 614, 616, 632, 639, 651). Fig. 8–13. Introgression between *glabra* and *A. pavia*. 8, *A. pavia* (Bowie Co., Texas; H. 570). 9, *A. pavia* (Tallahatchie Co., Miss.; H. 109). 10, *A. pavia* (× *glabra*) (Holmes Co., Miss.; H. 466). 11, *A. pavia* (× *glabra*) (Bossier Par., La.; H. 507). 12, *A. glabra* (× *pavia*) (Polk Co., Ark.; H. 598). 13, *A. glabra* (Ark. and Mo.; H. 597, 614, 616, 632, 639, 651).

A. glabra, and then shrubs along the creek which are *A. glabra* with introgression from *A. octandra*. Figure 3 is similar and represents a population in which *A. octandra* was found on the

ridges and *A. glabra* in the valley along a stream. The hybrids were scattered throughout the entire area, which had been cut over and was partly under cultivation and pasture.

The populations shown in Fig. 4 and 5 are typical of many scattered throughout Ohio, Kentucky, Indiana, Illinois, Missouri, and into Iowa (Map 1). In these, the specimens are referred to *A. glabra*, but they indicate, by the presence of stipitate glands, the influence of *A. octandra*. Figure 6 and 7 represent populations of "pure" *A. glabra* from Ohio and Arkanass. The smaller sized flowers in Arkansas are typical of the western populations, and the wide variation shown by Fig. 7 is because the specimens are from a number of different small populations in the region rather than a single local population.

It is evident from the diagrams that hybrids which are most nearly intermediate occur in the zone of overlap between the two species. In these areas there is some degree of reciprocal introgression. On the other hand, northward and westward in glaciated areas where *A. octandra* does not exist, there has been a widespread infiltration of some germplasm of *A. octandra* into the populations of *A. glabra*.

Aesculus glabra × pavia

Aesculus × bushii Schneider, Ill. Handb. Laubh. 2: 251. 1912.
Aesculus × mississippiensis Sarg., Jour. Arn. Arb. 2: 120. 1920.

Hybrids between *A. glabra* and *A. pavia* may be recognized by the flower color (yellow-red), stamens usually exserted, petals unequal, petal margin and surface glandular-pubescent, and pericarp irregularly spiny.

Intermediate forms due to hybridization are found, although infrequently, mostly in the region of overlap between ranges of the two parental species (Map 1), in northern Alabama, east-central Mississippi, Louisiana, southeastern Texas (*A. glabra* var. *arguta* × *pavia*), Arkansas, southeastern Oklahoma and eastern Missouri. There are outlying stations for *A. glabra* in east-central Mississippi which account for the presence of hybrids in this region.

Specimens examined.—**Alabama:** Jackson Co., *Harbison 1061* (NCU). **Arkansas:** Hempstead Co., *Bush 1098* (A); Marion Co., *D. M. Moore 516* (UARK); Polk Co., *Hardin 598* (GA, GH, MICH, NCSC); Stone Co., 26 Apr 1928,

Ashe (NCU). **Louisiana:** Bossier Par., *Hardin 507* (GA, GH, MICH, NCSC). **Mississippi:** Holmes Co., *Hardin 466* (GA, GH, MICH, NCSC); Noxubee Co., *Harbison 1061* (A, NCU); Oktibbeha Co., *Harbison 1055* (A). **Missouri:** Bollinger Co., *Steyermark 28404* (NY, US); Phelps Co., *B. H. Slavin 235* (A). **Oklahoma:** McCurtain Co., 14 Apr 1940, *C. G. Ward* (GA). **Texas:** Jackson Co., *S. G. Drushel 10512* (A).

Analyses of populations showing introgression between *A. glabra* and *A. pavia* are illustrated in Figs. 8–13. Reciprocal introgression between these two species is apparently restricted, for there is very little detectable influence on either parental species away from the area of the original crosses (Map 1). Figures 8 and 9 indicate populations of *A. pavia* in Texas and Mississippi. The Mississippi population (Fig. 9) is variable with respect to flower size, probably due to ecological conditions. The plants were growing in mixed hardwoods on the steep slopes of the loess hills and were under varying light conditions. The two populations shown in Figs. 10 and 11 are considered as *A. pavia*, but with slight introgression from *A. glabra* evidenced by the variation in color and glandular condition of the perianth. Both populations were in disturbed areas along county roads, and on the Coastal Plain which is the typical habitat for *A. pavia.*

In Polk County, Arkansas, and on the edge of Big Fork Creek just east of the town of Big Fork, there were a few trees which looked like *A. glabra*, but the flowers were reddish and had a few glands on the petal margins (Fig. 12). These show practically no variation among themselves, and may possibly represent a number of F_1 hybrids or backcrosses with *A. glabra. Aesculus glabra* was common throughout the area and along the creek; no *A. pavia* was found in the region. To give an indication of *A. glabra* in this series of scatter diagrams, populations from Arkansas have been graphed in Fig. 13.

Aesculus octandra × sylvatica

Aesculus glaucescens Sarg., Trees and Shrubs **2:** 257. 1913; in part and as to type.

The hybrid forms between *A. octandra* and *A. sylvatica* may be recognized mainly by their shrubby or small tree habit and the few stipitate glands mixed with tomentum on the pedicel and/or the lower part of the calyx. The result of introgression has been primarily an increased variation in the populations of *A. sylvatica*, although some reciprocal introgression takes place.

The type specimen for *A. glaucescens* is Harbison's no. 619, collected May 18, 1911 in Banks County, Georgia (A). This population (Harbison nos. 610, 618, 619, and 620) appears as a hybrid swarm between *A. octandra* and *A. sylvatica*, these collections and the duplicates of 619 representing different recombinants or the parent trees of *A. octandra*. From Sargent's description, *A. glaucescens* would be a synonym of *A. sylvatica* as defined by me, but the type specimen happens to be one of the recombinants belonging under this hybrid designation.

The hybrid forms between these two species are mostly found in the region of overlap between the parental species, in southeastern Tennessee, western North Carolina, northern Georgia, and northwestern South Carolina (Map 1).

Specimens examined.—**Georgia:** Banks Co., *Duncan & Hardin 16304* (GA); Dade Co., *Duncan 2417* (GA); Dawson Co., *Duncan & Adams 18536* (GA, MICH); Gordon Co., *Duncan 2507* (UC); Habersham Co., *Harbison 1576* (A, NCU); Hall Co., 8 May 1926, *Ashe* (A, NY); Lumpkin Co., *Duncan & Hardin 16007* (GA); Murray Co., *Duncan 15770* (GA); Rabun Co., *Harbison 23* (A); Stephens Co., *Harbison 6* (A). **North Carolina:** Macon Co., *Harbison 11* (A); Orange Co., Apr 1896, *Ashe* (NCU). **South Carolina:** Fairfield Co., *Hardin 112* (GA, MICH, NCSC); Lancaster Co., *Duncan & Hardin 15610* (NCU); Oconee Co., *McVaugh 5658* (A, UC). **Tennessee:** Franklin Co., *P. H. Webb 180* (TENN); Grainger Co., 13 May 1945, *S. A. Cain* (TENN).

Populations of *A. sylvatica* are shown in Figs. 27–30; all show relatively little variation. They are found in generally undisturbed mixed hardwoods and under fairly uniform environmental conditions. The populations in Figs. 32 and 33 are *A. sylvatica* with a strong influence from *A. octandra*, and *A. octandra* with influence from *A. sylvatica*, respectively. The two populations were found in mixed hardwoods which had been cut over to some extent. The typical *A. octandra*, from western North Carolina, is seen in Fig. 34.

Aesculus pavia × sylvatica

Pavia mutabilis Spach, Ann. des Sci. Nat., Bot., Sér. 2, **2:** 57. 1834.

Aesculus mutabilis (Spach) Schelle, in Beissner et al., Handb. Laubh.-Ben. 323. 1903.

Aesculus × harbisonii Sarg., Trees and Shrubs **2:** 259. 1913.

Aesculus × mutabilis var. *penduliflora* Sarg., Jour. Arn. Arb. **5:** 48. 1924.

Aesculus × mutabilis var. *induta* Sarg., l. c. 48. 1924.

Aesculus × mutabilis var. *harbisonii* (Sarg.) Rehd., Jour. Arn. Arb. **7:** 241. 1926.

Hybrid forms between *A. pavia* and *A. sylvatica* may usually be recognized by flower color (yellow-red) and petal margins glandular-villous.

The F_1 hybrids, backcrosses and recombinants are rather common in the Piedmont and Coastal Plain of the Carolinas, Georgia and Alabama, and also northward in the Ridge and Valley Province of eastern Tennessee into southern Kentucky (Map 1). Some well known populations, e. g., around Lea Lakes in Grainger County, Tennessee, Sequatchie Valley of Tennessee (Svenson, 1941), and Stone Mountain, Georgia (Hardin, 1957), have been favorite collecting areas for many years and are now recognized as hybrid swarms. The Stone Mountain population is of particular interest since it is the type locality for a number of species and varieties.

Hybrids between *A. pavia* and *A. sylvatica* were found as early as the middle 1800's in European gardens. Many of the names listed here in synonymy were based on the hybrids which arose in cultivation, or the seeds were collected in the field and planted in the Arnold Arboretum. The various varieties of *A.* × *mutabilis* described by Sargent represent different backcrosses or recombinants and later segregates which arose under cultivation.

Specimens examined.—**Alabama:** Baldwin Co., *J. G. Jack 2979* (us); DeKalb Co., *Harbison 555* (a); Etowah Co., *Harbison 543* (a, mo); Lee Co., *Duncan 9174* (ga, mo). **Florida:** Escambia Co., *Harbison 4128* (ncu); Liberty Co., yr. 1868, *B. F. Saurman* (pg). **Georgia:** Bartow Co., *Duncan 8028* (ga, gh, tenn, uc, us); Bryan Co., *Pryon & McVaugh 1384* (ga); Butts Co., *Hardin 104* (ga, mich, ncsc); Catoosa Co., *Duncan 15764* (ga); Chatooga Co., *Duncan & Hardin 15919* (ga, mich); Cobb Co., *Duncan 13489* (ga); Coweta Co., *Duncan & Huttleston 10707* (ga); Crawford Co., *Hardin 101* (ga, mich, ncsc); DeKalb Co., *Hardin 107* (ga, mich, ncsc); Floyd Co., *Duncan & Hardin 15252* (ga, mich); Forsyth Co., *Duncan 5268* (ga); Fulton Co., *Duncan 9347* (ga); Hall Co., *Duncan 18569* (ga); Hart Co., *Duncan 4825* (ga, gh, mo, uc, us); Jasper Co., Apr 1842, *T. C. Porter* (gh); Meriwether Co., *Duncan & Huttleston 10765* (ga); Muscogee Co., 14 Apr 1940, *L. R. Kische* (ncu); Paulding Co., *Pyron & McVaugh 2599* (ga); Richmond Co., 18 Mar 1909, *C. S. Sargent* (a); Talbot Co., 7 Aug 1941, *O. Battle* (us); Telfair Co., 9 Apr 1918, *Harbison* (ncu); Troup Co., *Duncan & Huttleston 10793* (ga); Upson Co., *A. Cronquist 4337* (ga, gh, mo, us); Whitfield Co., *Duncan 15769* (ga). **Kentucky:** Bell Co., *H. A. Gleason 8831* (ny); "southern Ky.", May-Aug 1900, *Sadie F. Price 2385* (gh). **North Carolina:** Bladen Co., *Radford 6871* (ncu); Columbus Co., *C. V. Morton 2122* (us); Durham Co., *Harbison 15100* (ncu); Halifax Co., Apr 1894, *C. S. Williamson* (ph); New Hanover Co., May 1867, *W. M. Canby* (mich, ph); Orange Co., 2 May 1916, *H. R. Totten* (ncu); Wake Co., *Harbison 7* (a). **South Carolina:** Anderson Co., yr. 1886, *F. H. Earle*

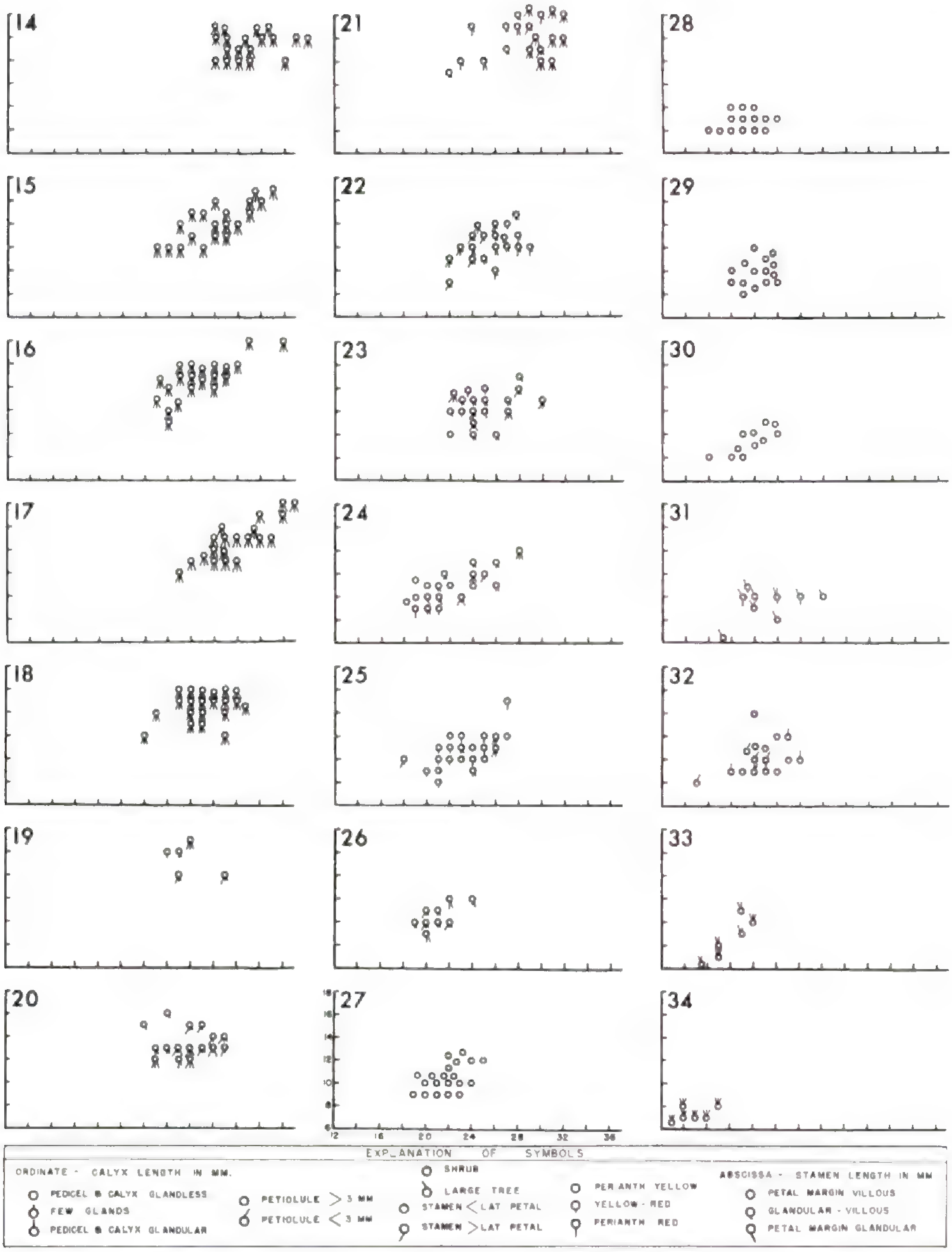


Fig. 14–34. Pictorialized scatter diagrams showing introgression between *A. pavia*, *sylvatica* and *A. octandra*. 14, *A. pavia* (Appling Co., Ga.; H. 105). 15, *A. pavia* (Geneva Co., Ala.; H. 102). 16, *A. pavia* (Crenshaw Co., Ala.; H. 103). 17, *A. pavia* (Effingham Co., Ga.; H. 106). 18, *A. pavia* (Winston Co., Ala.; H. 108). 19, *A. pavia* (× *sylvatica*) (Catoosa Co., Ga.; Duncan 12350). 20, *A. pavia* (× *sylvatica*) (Floyd Co., Ga.; Duncan 15750). 21, *A. pavia* (× *sylvatica*) (Crawford Co., Ga.; H. 101). 22, *A. pavia* × *sylvatica* (DeKalb Co., Ga.; H. 129). 23, *A. pavia* × *sylvatica* (DeKalb Co., Ga.; H. 107). 24, *A. sylvatica* (× *pavia*) (Butts Co., Ga.; H. 104). 25, *A. sylvatica* (× *pavia*) (Hart Co., Ga.; H. 111). 26, *A. sylvatica* (× *pavia*) (Troup Co., Ga.; Duncan 10793). 27, *A. sylvatica* (Morgan Co., Ga.; Duncan 10825). 28, *A. sylvatica* (Union Co., S. C.; H. 113). 29, *A. sylvatica* (Clarke

(NY); Clarendon Co., *W. Stone 624* (PH); Darlington Co., *B. E. Smith 1615* (NCU); Dorchester Co., *Duncan 5902* (GA); Oconee Co., *Harbison 6* (A). **Tennessee:** Bledsoe Co., *Shanks 1390* (TENN); Grainger Co., *M. Webster 28* (GA); Marion Co., *Shanks, Hardin, Woods & Barkley 15464* (TENN); Rhea Co., *Sharp 19071* (TENN); Sequatchie Co., *Cain & Sharp 4398* (NY, TENN); Van Buren Co., 27 Apr 1952, *J. E. Byrd* (TENN).

The populations of "good" *A. pavia* are shown in Figs. 14–18. There is some variation, in size of flowers, between populations and within single populations which is probably due to ecological conditions. Each of these populations was found in a relatively mature area under mixed hardwoods and in well-drained soils.

The populations shown in Figs. 19–21 represent *A. pavia* with influence from *A. sylvatica.* Figures 22 and 23 are the populations from Stone Mountain, Georgia, which have been previously described (Hardin, 1957). The populations in Figs. 24–26 are primarily *A. sylvatica* with strong influence from *A. pavia.* These intermediate populations for the most part were found in disturbed areas, along road sides, heavily lumbered woods, pastured lands, or the edges of cultivated farms. *Aesculus sylvatica* is represented in Figs. 27–30.

The reciprocal introgression between these two species has resulted in a heightened variability in the two parental species, and this gene flow has gone far into the populations of the parental species and away from the region of the original crosses (Map 1).

Aesculus octandra × (pavia × sylvatica)

Aesculus woerlitzensis Koehne, Repert. Sp. Nov. Reg. Veg. **11:** 396. 1913.

Aesculus woerlitzensis var. *ellwangeri* Rehd., Mitt. Deutsch. Dendr. Ges. 1913 (22): 258. 1914.

Aesculus × dupontii Sarg., Jour. Arn. Arb. **5:** 46. 1924.

Aesculus × dupontii var. *hessei* Sarg., l. c. 47. 1924.

Occasional specimens have been seen which have characters of the three species *A. octandra, A. pavia* and *A. sylvatica.* Most of these are best represented (at least on the basis of morphological characteristics) as *A. octandra × (pavia × sylvatica)* and recognized by glandular-villous petal margins, yellow-red flowers, and with stipitate glands mixed with tomentum on the

Co., Ga.; H. 117). 30, *A. sylvatica* (Elbert Co., Ga.; H. 116). 31, *A. sylvatica × octandra × pavia* (Gordon Co., Ga.; Duncan 15744). 32, *A. sylvatica* (× *octandra*) (Fairfield Co., S. C.; H. 112). 33, *A. octandra* (× *sylvatica*) (Murray Co., Ga.; Duncan 15770). 34, *A. octandra* (Ga., N. C., Tenn.; H. 118–122, 131, 725).

pedicels and lower part of the calyx. These hybrids are not very different from the *A. octandra* × *pavia*, but the petal margins are more like the *A. pavia* × *sylvatica* hybrid.

The specimens labeled as *A.* × *dupontii* and grown at the Arnold Arboretum and at the Botanical Gardens, University of Michigan (from the type tree in front of the DuPont mansion, Winterthur, Delaware), show characteristics of all three of these species. Just what the original crosses were, of course, is not known. Sargent, in the original description, supposed that the cross was between *A. pavia* and *A. sylvatica*, but he overlooked the important glands on the pedicels a characteristic only of *A. octandra*.

Aesculus woerlitzensis, and its variety, originated in European gardens or nurseries—the actual origin is unknown. They have been cultivated in the Arnold Arboretum and other gardens in the United States for many years.

Since *A. sylvatica* is located in the relatively narrow Piedmont between *A. octandra* of the Appalachians and *A. pavia* of the Coastal Plain, and since the apparent gene flow from these two species extends some distance into *A. sylvatica* from the areas of original hybridization, occasional populations of *A. sylvatica* would be expected to show influence from both *A. pavia* and *A. octandra*. Such populations with various degrees of influence from the three parental species have been found (Map 1). The population in Gordon County, Georgia, is shown in Fig. 31.

Specimens examined.—**Georgia:** Bartow Co., *Duncan 8094* (GA); Forsyth Co., *Duncan 5268* (GA); Gordon Co., *Duncan 15744* (GA); Hall Co., *Duncan 18569* (GA, MICH); Whitfield Co., *Duncan 15769* (GA). **North Carolina:** Halifax Co., 27 Apr 1897, *J. K. Small* (NY). **South Carolina:** Lancaster Co., *Duncan & Hardin 15610* (GA, NCU); Richland Co., 13 Apr 1937, *J. H. Chapman* (GA).

Aesculus octandra × pavia

Aesculus hybrida DC., Cat. Hort. Monsp. 75. 1813.
Pavia hybrida (DC.) DC., Prod. **1:** 598. 1824.
Aesculus pavia var. *arguta* Lindl., Bot. Reg. 993. 1826.
Pavia livida Spach, Ann. des Sci. Nat., Bot., Sér. 2, **2:** 56. 1834.
Pavia hybrida Spach, l. c. 57. 1834.
Pavia versicolor Spach, l. c. 57. 1834.
Pavia lindleyana Spach, l. c. 59. 1834.
Pavia arguta (Lindl.) Raf., Alsog. Am. 74. 1838.
Aesculus versicolor Wenderoth, Ind. Sem. Hort. Acad. Marburg. **1853:** 4. 1853.

Aesculus flava var. *purpurascens* Gray, Man. Bot. N. U. S., ed. 2, 83. 1856.

Aesculus octandra var. *hybrida* Sarg., Silva No. Amer. **2:** 60. 1891.

Aesculus octandra var. *purpurascens* (Gray) Schneider, Ill. Handb. Laubh. **2:** 252. 1912.

This hybrid is recognized by flower color (red-yellow), the stipitate glands on the pedicel and glandular-pubescent petal margin.

No natural hybrids between these two species have been recognized. Garden hybrids, however, representing this cross have long been in cultivation. Sargent (1913) states that *A. hybrida* appeared in the Botanic Garden at Montpelier early in the nineteenth century. It is now cultivated in many varieties in Europe and to a lesser extent in America.

Early records of *A. hybrida* (or synonym) from West Virginia, Virginia and Maryland are probably based on the cultivated hybrids of European origin. Sargent (1913) presents a clear account of the history of these hybrids and the confusion which they have brought about in the nomenclature of the natural populations in eastern America.

With sympatric introgression occurring in these species of section *Pavia*, the identity of the entities is maintained by ecological and/or internal barriers of various kinds. The effectiveness or strength of these barriers (whatever they may be) varies among the different crosses. For example, introgression between *A. glabra* and *A. pavia* is apparently quite restricted, while, on the other hand, the introgression between *A. glabra* and *A. octandra* is widespread. Where the barriers to crossing are slight, an increased variability in the participating populations is brought about by the segregation and independent assortment of the various genes and alleles. Although the influence is mainly on one of the parents, reciprocal introgression does occur in all cases in varying degrees.

The significant point is that even with such a great amount of gene flow into certain species (e. g., *A. sylvatica*), they remain distinct. Heiser (1949), in discussing such species, states that "perhaps the ability to remain distinct in spite of hybridization entitles them rightfully to the designation of 'species'." The apparent discontinuity in breeding, which keeps these entities

apart, is, in my opinion, a very important criterion for the recognition of the species in *Aesculus* section *Pavia*.

It is thought that introgression in section *Pavia* has been going on during relatively recent times only. Presumably these species arose by allopatric speciation possibly in the Appalachians, and evolved independently for some time, but without developing complete barriers to interbreeding. During or after Pleistocene the species ranges came together because of expanding ranges and/or migrations of the populations. Once sympatric, introgression could proceed.

Introgression may be of primary importance as a factor in the future evolution of the eastern buckeyes. With continued gene flow and heightened variability within the populations, there is an increased plasticity of the species—a plasticity which may make for increased survival value in the face of changing environmental conditions.

In connection with the analysis of hybridization in *Aesculus*, the cytology, or more specifically the karyology, of the genus was studied. Although cytological studies are rather monotonous in this genus, the study of chromosomes—number and morphology plus their meiotic behavior—does, to some extent, aid in indicating hybridization between species.

Very little cytological investigation was undertaken during the course of this study, but the chromosome number ($n = 20$) was checked in many specimens representing six of the species. It was hoped that chromosome counts of *A. parryi*, *A. californica* and *Billia* spp. could be made, but this was not accomplished because of the lack of adequate living material. No published counts have been found for the above or for *A. indica*, *A. assamica* or *A. turbinata*. A tentative count was made from root tips and anthers of *A. californica*, but in each case the count of $2n = 40$ and $n = 20$ was somewhat subjective. The numbers in all other species as well as in many of the described hybrids and, now unrecognized, varieties and species, have been reported by one or more authors (Darlington and Wylie, 1956; Gaiser, 1930, 1930a; Seitz, 1951; Wang, 1939).

The only reported differences in the chromosome number in the family are for *A. carnea* and *A. plantierensis*, which have been mentioned earlier. According to Upcott (1936), secondary

pairing and the occasional formation of quadrivalents, suggests that possibly the parents are tetraploids and therefore *A. carnea* is actually an octoploid and *A. plantierensis* a hexaploid. Stebbins (1950) refers to this by using *Aesculus* as one of the examples of a genus in temperate regions of which the base number (x = 20) is probably of ancient polyploid derivation.

Individual chromosomes of a karyotype in *Aesculus* do not vary markedly in shape or size (Hoar, 1927); there are, however, slight differences in the chromosome size of different species. Skovsted (1929) found a recognizable difference in size between *A. hippocastanum*, *A. glabra* and *A. parviflora*, all of which have relatively small chromosomes, and *A. pavia* and *A. octandra*, which have larger ones.

Probably the most significant evidence to come from cytological investigations of *Aesculus* has been the recognition of meiotic irregularities. These are discussed particularly by Hoar (1927) and to some extent by Pelletier (1935). Hoar recognized no irregularities in the "good" species, but in others, lagging chromosomes and polyspory were common, and the percentages of abortive pollen were high. He found that such irregularities in meiosis and pollen formation were common in both artificial and natural hybrids. He therefore concluded that such irregularities found in *Aesculus* specimens placed "their ancestry under suspicion." I have checked the frequencies of abortive pollen in numerous specimens. Those recognized by floral characters as being of hybrid origin have high percentages of abortive pollen, and those identified as "good species" have all viable pollen or only a very low percentage of abortives. This agrees entirely with the present concepts of the species, and is additional evidence for introgression between species in the section *Pavia*.

Hoar (1927) raised one interesting question concerning the propagation of the plants with high precentages of abortive pollen. Some are clonal, propagated to some extent by root sprouts, but there is no indication of apomictic seed production in any of the species. Obviously, there is enough viable pollen to result in a number of seeds each season. A perennial plant such as the buckeye is not dependent on a great quantity of seeds each season for survival. The great number of abortive pollen grains, however, could result in an incomplete fertilization,

which has been suggested earlier (Hardin, 1955) as a possible cause for the relatively few seeds which are produced per capsule.
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A REVISION OF THE VERNAL SPECIES OF HELENIUM (COMPOSITAE)

HOWARD F. L. ROCK

(continued from p. 178)

To complete the confusion, since 1874 both *Galardia fimbriata* Michx. and *Leptopoda fimbriata* T. & G. have often been considered to be the same taxon, despite the inadequate understanding of either the nomenclatural or taxonomic complexities surrounding both of the binomials. This has led to a confused application of both Wood's *H. fimbriatum* and Gray's *H. fimbriatum* to various taxa to be found from the Carolinas to Texas. Moreover, the parenthetical author has been variously cited as either Michaux or Torrey and Gray or else left out completely. Nevertheless, the taxon described by Torrey and Gray as *Leptopoda fimbriata* is recognized here as a distinct species and that this species is not the same as either of the two elements (*H. vernale* and *H. pinnatifidum*) included within *Galardia fimbriata* Michx.

There appears, then, to be only one course of action possible under the provisions of the rules and preamble of the present Code. This course of action is to invoke the application of Article 65 by which an ambiguous name must be rejected. Therefore the name *Helenium fimbriatum* is hereby rejected from use for this species. In order to avoid futher confusion and inasmuch as Thomas Drummond was the first person to collect this plant, the epithet *Drummondii* has been chosen to form the new name *Helenium Drummondii* for this species.

Helenium Drummondii is most likely to be confused, upon superficial examination, with *Helenium vernale*. The character of the pappus, however, is sufficient to result in a ready separation of the two. In *H. Drummondii* it is usually longer and always distinctively slashed into a multitude of *fimbriae*, the fimbriae

forming over one-half the body of the scale and being crimped or crinkled. The hairy-pubescent achenes, the longer and narrower ray corollas and the lanulose pubescence at the top of the peduncle in *H. Drummondii* reinforce the distinction between the two. *Helenium Drummondii* may be distinguished from *H. pinnatifidum* on the basis of the more-decurrent cauline leaves, the petioloid radical leaves, the longer and narrower ray corollas and the characters of the pappus scales.

The two specimens of this species reputedly from Florida pose a distributional problem in that all the other specimens of this species are either from Texas or western Louisiana. There is no definite locality given for these two specimens other than "Florida" or "East Florida." In addition, as far as this study has revealed, this species has not been collected in Florida apart from these two specimens nor since 1876. As near as can be determined, the two specimens belong to the taxon *H. Drummondii* and there is no reason for considering them as otherwise. They may possibly represent a "lost" element of the Floridian flora that is now either extinct or very highly restricted in distribution so as not to have been re-collected.

However, at the Gray Herbarium there is a specimen of this species which was collected by Leavenworth in Texas "near the Salina [or Sabine]." This specimen is the syntype of *Leptopoda fimbriata* T. & G. that was acknowledged by Torrey and Gray to be from Texas. It seems highly probable that the syntype collection by Leavenworth from East Florida represents a mislabeling as to locality of collection, and may well be a duplicate collection of the one made in Texas.

The specimen collected by Mary Treat is not so easily explained or dismissed for there is no indication that she ever was in Texas or Louisiana collecting plants. In this particular case, it may well be that the Treat collection is the result of a chance introduction of *H. Drummondii* to the eastern coast of Florida and Mrs. Treat happened to be there one late winter to collect it. A more extreme possibility is that these two specimens represent a second origination of *Helenium Drummondii* from either *H. vernale* or *H. pinnatifidum* in the eastern part of Florida and are not directly related to *H. Drummondii* of Texas and Louisiana.

4. **Helenium brevifolium** (Nutt.) A. Wood

Leptopoda brevifolia Nutt. Trans. Am. Phil. Soc. ser. 2. **7:** 373. 1841. Syntype: collected by DeSchweinitz, Yadkin (PH). Syntype (BM—not seen).

Leptopoda brevifolia Nutt. var. β T. & G. Fl. N. A. **2:** 387. 1842. Lectotype: "*Leptopoda ? integrifolia, L. brevifolia* Nutt., Raleigh, N. C., M. A. Curtis" (NY).

Helenium brevifolium (Nutt.) A. Wood, Am. Bot. & Fl. 182. 1870.

Helenium brevifolium (Nutt.) A. Gray, Proc. Am. Acad. Arts & Sci. **9:** 205. 1874. Superfluous name repeating the combination of A. Wood.

Helenium Curtisii A. Gray, Proc. Am. Acad. Arts & Sci. **9:** 204. 1874. Lectotype: "*Leptopoda brevifolia*, Raleigh, N. C., M. A. Curtis" (GH).

Heleniastrum brevifolium (A. Gray) O. Ktze. Rev. Gen. (pt. 1) 342. 1891.

Heleniastrum Curtisii (A. Gray) O. Ktze. Rev. Gen. (pt. 1) 342. 1891.

Helenium integrifolium Mohr, Contrib. Nat. Herb. **6:** 811. (1901) non Sesse & Moc. Fl. Mex. 189. 1894.

Perennial herb, the stem developing from a rosette formed the previous season from the seedling or as an offset from the short caudex; caudex with coarsely fibrous roots and often with the persistent fibrous leaf bases of prior rosettes. Plant erect, (2.2–) 3.2–7.2 (–10.0) dm. high, single-stemmed, often occurring in clusters, *branched, each branch bearing but a single head.* While the growth is of a determinate type, with a head terminating each branch and the successive branches developing from the upper leaf axils, the over-all pattern of the branching system is of the type commonly referred to as "*corymbosely branched.*" Heads 1–4 in number, the larger number occurring on the more robust plants. Stems sulcate, glabrous and often anthocyanaceous below, becoming increasingly striate above. Peduncle striate, lanulose below, becoming increasingly pubescent upwards *so as to be lanose to tomentose at the base of the involucre in extreme cases.* Lateral peduncles increasing in length with a decreased position on the stem, often over-topping the terminal or central peduncle. Peduncles not noticeably enlarged or fistulous beneath the involucre. Leaves, except for the uppermost ones, glabrous, uni-nerved with the lateral nerves obscured, impressed-punctate, resin-atomiferous, gradually reduced upwards in the more robust plants, but often appearing scapose in the more depauperate plants. Radical leaves obovate, spathulate to oblanceolate, usually intact and present; margin entire, repand, scalloped, scalloped-denticulate to shallowly incised; apex obtuse to more or less acute; *the basal portion tapering to form a petioloid structure,* enlarging again within the rosette so as to be somewhat clasping; (2.5–) 4.0–10.5 (–18.0) cm. long, (0.8–) 1.2–2.0 (–2.5) cm. wide. Cauline leaves becoming reduced in size and more spathulate to linear-lanceolate; margin somewhat denticulate; bases decurrent along the stem so as to form a manifest wing. The uppermost bracts are often lanulose, especially toward the base where the axil is often arachnoid-pubescent along with the adjacent stem portions. Developing buds usually quite tomentose but becoming

decreasingly so with age and development. Involucre biseriate, the outer series exceeding the inner; phyllaries linear-lanceolate, 4.0–6.0 mm. long, 1.0–2.0 mm. wide at the base, pubescent, acuminate, becoming withered and reflexed or not reflexed with age. Heads convex to mostly hemispherical, 1.2–2.0 cm. wide, 1.0–1.5 cm. high; receptacle convex to subglobose. Ray florets neutral; ligules yellow, 1.5–1.9 cm. long, pubescent below, broadly cuneate, 3–4-fid at the apex, resin-atomiferous; achenes abortive and less than those of the disk in size. *Disk brown*, decidedly so to sometimes only faintly, especially in dried specimens when it then appears to be a sordid-yellow. Disk florets fertile; corollas pentamerous, 3.0–5.0 mm. long, the lobes pubescent-glandular and red-purple to red brown in color, resin-atomiferous, and with a short basal tube; pappus scales *obovate, somewhat clawed as a rule*, verging to oblanceolate, obtuse, (1.0–) 1.5 (–2.0) mm. long, the margin more or less entire, 5–10 in number; *achenes hairy-pubescent* on the ribs, resin-atomiferous, 1.0–1.5 mm. long, columnar to truncate-turbinate in shape.

DISTRIBUTION: Plants of scattered localities in the Southeastern United States; occurring in upland bogs, swamps and wet depressions in the inner Piedmont-lower Appalachian provinces of North Carolina, Georgia and Alabama, Coastal Plain-like habitats of the Piedmont of North Carolina and Alabama such as *Sarracenia*-type bogs, wet pine woods and wet meadows, as well as in the Coastal Plain proper of southeastern Virginia, southeastern North Carolina, the western part of the panhandle of Florida, and Alabama, Mississippi and Louisiana in such habitats as wet pine barrens, *Sarracenia* bogs, shrub-bogs, margins of ponds, swamps and wet ditches. (Map 2)

REPRESENTATIVE SPECIMENS.—**Louisiana.** St. Tammany Parish: Slidell, 2 April 1887, *Joor s.n.* (NO). **Mississippi.** Harrison Co.: near Biloxi, *Perkins & Hall 2845* (POM). Jackson Co.: Ocean Springs, April 1892, *Skehan s.n.* (DUKE, GH, IA, MO, NCU, SMU, WIS). **Alabama.** Baldwin Co.: Point Clear, Rte. 98, S. of Fairhope, *Hood 4518* (FLAS). Cherokee Co.: about 2 m. NE. of Center, *Harper 91* (GH, MO, NY). Cullman Co.: about 4 m. ENE. of Cullman, *Harper 3724* (GH, MICH, MO, PH, US). Escambia Co.: Flomaton, *Bilt. Herb. distrib. 9588a* (GH, MIN, NCU, POM). Lee Co.: Auburn, 9 May 1896, *Earle & Underwood s.n.* (NY). Mobile Co.: Mobile, 26 April 1898, *Baker s.n.* (F, NY, POM). Russell Co.: near Fort Mitchell, *Harper 2* (GH, MO, NY, PH). Washington Co.: 3.8 m. NW. of Citronelle, *Cory 58563* (NCSC, SMU). **Florida.** Escambia Co.: Ensley, *Goodale 69874* (GH). Okaloosa Co.: 6 m. NW. of Fort Walton, *Tyson 583* (FLAS). Santa Rosa Co.: Milton, *Fassett 21170* (MIN, WIS). Walton Co.: DeFuniack Springs, *Curtiss 6383* (BKL, F, GH, MIN, NY, UC, US). Washington Co.: 10 m. N. of Ebro, Rte, 79. *Hood 1678* (FLAS). **Georgia.** Douglas Co.: 1.3 m. W. of Villa Rica, *McDowell & Venard 579* (DUKE). Meriwether Co.: Peters, *Twomey s.n.* (PH). **North Carolina.** Brunswick Co.: near Maco, along Rte. 74-76, *Godfrey & Weibe 50368* (DUKE, GH, NCSC, SMU, WS). Catawba Co.: N. of Hickory, *Small & Heller 447* (F, MO, NY, PENN, PH, UC, US). Henderson Co.: East Flat Rock, *Correll, Blomquist & Garren 5145* (DUKE). Iredell Co.: 3.2 m. W. of Harmony, *Radford 2655* (NCU). New Hanover Co.: Wilmington, *M. A. Curtis s.n.* (PH). Wake Co.: sphagnous bog at Method, Raleigh, *Godfrey 3974* (NCSC, NCU, NY).

Virginia. Greensville Co.: N. of Dahlia, *Fernald & Long 10051* (F, GH, MO, NY, US). James City Co.: about 3 m. W. of Williamsburg, *Baldwin, Jr. 14861* (DUKE, MO, NCSC, NY, US).

In the *North American Flora* Torrey and Gray established a variety within this taxon, variety β, a reputedly very local endemic from the vicinity of Raleigh, North Carolina. The variety differed from the more typical part of the species in that it was more robust, *i.e.* "stem stouter and taller; leaves larger; the cauline more strongly decurrent." Asa Gray, 32 years later, elevated the variety to specific status using the name *Helenium Curtisii* and added as diagnostic characters for the separation of the two, the distinction that *H. Curtisii* had an ovate-conical receptacle and that the disk was subglobose. This was in contra-distinction to the barely hemispherical receptacle and convex disk of *H. brevifolium.*

The present study could not validate the characters adduced by Torrey and/or Gray for the separation of these two taxa, *Helenium brevifolium* and *Helenium Curtisii,* except to the extent that in the same population some of the plants are more robust than some of the others. Consequently, no formal taxonomic recognition is given in this treatment to *Helenium Curtisii* as a taxon apart from *Helenium brevifolium.*

Unfortunately it is no longer possible to collect "*Curtisii*" at the type locality. In the late spring of 1955 the author made a trip to the vicinity in an effort to relocate it. The type locality was known by hearsay to be a bog just outside of Raleigh, close by Meridith College in a suburban area known as Method. Several boggy spots were located, including a known Coastal Plain-like one containing *Sarracenia flava* but not "*H. Curtisii.*" On a second trip, the correct location, as far as it could be determined, was finally located and the reason for the difficulty in finding it was apparent. Where once had been a sphagnous bog with Coastal Plain-like aspects was now a paved street with two rows of half-completed houses on each side. The type locality, with whatever "*Curtisii*" that might have persisted through the years, had been bull-dozed from existence. All that remained of the bog were some springy places in the new back-yards of the houses.

Several other locations are now known in North Carolina,

however, and in Virginia where *Helenium brevifolium* occurs. Specimens collected from these populations have been identified and accepted as "*Curtisii*" in the past. Indeed, it takes no imagination or struggling with the keys to identify many of the specimens of *H. brevifolium* from the Coastal Plain of Florida, Alabama, Mississippi and North Carolina as "*Curtisii*" while duplicates of the same collections pass as *H. brevifolium*. The author has visited three of these locations in Iredell Co., N. C. and has had the advantage of observing the "*Curtisii*" element in the field and making mass collections. If, in the field, one were to collect along a line-transect through one of the boggy areas that is somewhat open and subject to seasonal drying-out in the late spring and early summer, the relationship of these two elements, *H. brevifolium* and "*Curtisii*" is clearly seen. Those plants from the outer, drier edges of the bog would be identified as *H. brevifolium*. The plants from the center of the bog, where the water is more plentiful and present for the longest period of time, however, would be identified as "*Curtisii*." Those plants from the far side of the bog, where a drier area is again encountered, would in turn be identified, once more, as *H. brevifolium*. Those plants from between the center and the outer edges, as well as those from tussock portions of the bog, grade off from the aspect of *brevifolium* to that of "*Curtisii*." In those bogs where the water is plentiful all season, more of the plants would be identified as "*Curtisii*" than not, especially from those bogs that are deep in ravines and shaded by overhead hardwoods. It would appear, then, that the "*Curtisii*" element is no more than a growth form of *H. brevifolium* induced by highly mesophytic conditions.

Helenium brevifolium is easily distinguished from *H. pinnatifidum*, *H. vernale* and *H. Drummondii* on the basis of the following characters:

1. the red-brown tipped disk florets so that the disk is red-brown colored
2. the corymbose branching habit, with the branches terminated by a single head
3. the obovate and more or less clawed pappus scales.

Helenium brevifolium can, in turn, be distinguished from the other taxon with which it might be confused, *H. campestre*, on the basis of:

1. the achene is hairy-pubescent rather than puberulent
2. the pappus scales are twice as long, 1 mm. long or more in contrast to 0.5 mm
3. the stem and foliage, excepting the uppermost, are glabrous
4. the radical leaves are petioloid.

5. **Helenium campestre** Small

Helenium campestre Small, Fl. SE. U. S., 1291. 1903. Holotype: Collected by Dr. Hasse, 25 May 1885, Little Rock, Pulaski Co., Arkansas (NY).

Perennial herb, the stem developing from a basal rosette formed the previous season from the seedling or as an offset from the short caudex; caudex with coarsely fibrous roots and often with the persistent fibrous leaf bases of prior rosettes. Plant erect, 4.0–6.7 dm. high, single-stemmed, *branched, each branch usually bearing but a single head,* though in the more robust plants the branches are sometimes bifid toward the apex and thus bearing two heads. While the growth is of a determinate type, with a head terminating each branch and the successive branches arising from the upper leaf axils, the over-all pattern of the inflorescence is of the type commonly termed *corymbosely branched.* Heads 1–8 in number, the more robust plants with the greater number, and usually quite showy by virtue of the large rays. Stems sulcate, winged and *noticeably hirsute below,* becoming striate and finely pubescent above. Peduncles striate, becoming densely pubescent above, lateral ones becoming longer with descending position on the stem, usually equal to the central one, and becoming enlarged and fistulous beneath the involucre. *Leaves decidedly hairy-pubescent,* uninerved with the lateral nerves obscured, impressed-punctate, resin-atomiferous, becoming gradually reduced upwards. Radical leaves obovate, spathulate, oblanceolate, to elliptic-lanceolate, usually intact and present; margin entire to repand, occasionally scalloped or pinnatifid-incised; apex obtuse; *the basal portion not petioloid* but gradually tapered and becoming enlarged again within the rosette so as to be somewhat clasping; 3.5–7.0 cm. long, 0.5–1.7 cm. wide. Cauline leaves becoming reduced upwards; not petioloid; bases decurrent along the stem so as to manifest a wing; oblanceolate, elliptic-lanceolate to linear-lanceolate; margin entire to repand, the uppermost bracteate ones occasionally somewhat denticulate; apex acute to slightly acuminate; base gradually tapered to the wing; usually less coarsely pubescent than the basal leaves. Involucre biseriate, the outer series exceeding the inner; less deeply parted than in preceding taxa so as to form a slight cupule at the base; phyllaries linear-lanceolate, 5.0–6.5 mm. long, 1.5–2.0 (–3.5) mm. wide at the base, pubescent, acute to acuminate, becoming more or less reflexed ultimately. Heads mostly hemispherical to subglobose, 0.8–1.5 cm. high, 1.0–2.0 cm. wide; receptacle mostly subglobose though often hemispherical. Ray florets neutral; ligules yellow, prominent and showy, resin-atomiferous and pubescent below, 1.5–2.5 cm. long; achenes abortive and less than those of the disk in length. *Disk brown;* disk

florets fertile; corollas 3.0–4.5 mm. long, brown-tipped on the lobes, glandular-pubescent on the lobes, pentamerous, resin-atomiferous, cylindric to cylindric-campanulate in outline with a short basal tube; *pappus obovate to suborbicular, not clawed*, 5–10 in number, *0.4–0.5 mm. long*, obtuse at the apex, margin entire to erose; achenes *puberulent* on the ribs, resin-atomiferous, 1.0–1.5 mm. long, columnar to truncate-turbinate in shape.

DISTRIBUTION: Known only from seven counties of eastern Arkansas, between the Ouachita Mountains and the Mississippi Alluvial Plain; occurring in low open pinewoods, fertile bottoms, flatwoods, wet pinelands, rocky open woods, river bottoms, ridge thickets and moist places in prairies. (MAP 2)

REPRESENTATIVE SPECIMENS.—**Arkansas.** Drew Co.: Wilmar, *Demaree 15057* (F, GH, MIN, MO, NY). Faulkner Co.: near Conway, *Palmer 27110* (MO, UARK). Independence Co.: Batesville, *Demaree 26766* (OKLA, SMU, TEX). Prairie Co.: Grand Prairie near Hazen, *Palmer 25064* (GH, NY). Pulaski Co.: base of Maumelle Mountain near Pinnacle, *Palmer 22993* (F, MO, UARK). St. Francis Co.: Forrest City, *Demaree 15116* (F). White Co.: W. Bradford, *Moore 450469* (UARK).

Until this species was recognized as being distinct by J. K. Small, it had been confused most often with *Helenium flexuosum* Raf. (*H. nudiflorum* Nutt.). It can be distinguished at a glance by the corymbose branching habit and the small number of large heads in contrast to the paniculate branching and large number of small heads of *H. flexuosum.* The characters by which *H. campestre* may be distinguished from *H. brevifolium* have been pointed out under the treatment of the latter. While *H. campestre* has been most often confused with *H. flexuosum*, its closest affinity appears to be with *H. brevifolium.* Much of the discussion related to this taxon has already been brought out in relation with that of *H. brevifolium* and *H. campestre* in the portion of this paper devoted to relationships.

6. **Helenium flexuosum** Raf.

Helenium flexuosum Raf. New Fl. N. A. (pt. 4): 81. 1838. Neotype: Collected by Mary and Emily Mohr, Aug. 1884, Terre Haute, Vigo County, Indiana (US); original type locality ascribed by Rafinesque was the "River Wabash."

Helenium dichotomum Raf. New Fl. N. A. (pt. 4): 81. 1838.

Helenium nudiflorum Nutt. Trans. Am. Phil. Soc. ser. 2. **7:** 384. 1841. Syntype: "*Helenium*nudiflorum* (Nutt.) Ark." (PH); Syntype: "*Helenium*nudiflorum,* Red River" collected by Nuttall, ex herb. Elias Durand (GH); Syntype: (BM—not seen).

Helenium micranthum Nutt. Trans. Am. Phil. Soc. ser. 2. **7:** 385. 1841. No type material located.

Leptopoda brachypoda T. & G. Fl. N. A. **2:** 388. 1842. Lectotype: Collected in Louisiana, Aug. 1840, by Dr. Hale (NY).

Leptopoda brachypoda T. & G. var. β. T. & G. Fl. N. A. **2:** 388. 1842. Lectotype: Collected in Louisiana by Dr. Leavenworth (NY).

Helenium atropurpureum Kth. & Bouché, Ind. Sem. Hort. Berol. Anno 1845 Collectorum 12. 1845. Type: original description; cultivar.

Helenium atropurpureum Kth. & Bouché var. *grandicephalum* LeMaire, L'Ill. Hort. **10:** 375. 1863. Type: illustration and original description; cultivar.

Helenium seminariense Featherman, Rep. So. & Cent. La. 1870, Fl. Ludov. 74. 1871. Lectotype: "Helenium seminariense" (GH).

Helenium brachypoda (T. & G.) A. Wood, Am. Bot. & Fl. 182. 1870.

Helenium nudiflorum Nutt. var. *purpurea* Hale ex. A. Gray, Proc. Am. Acad. Arts & Sci. **9:** 203. 1874. Type: the same as *L. brachypoda* T. & G. var. β. T. & G.

Heleniastrum nudiflorum (Nutt.) O. Ktze. Rev. Gen. (pt. 1) 342. 1891.

Helenium polyphyllum Small, Fl. SE. U. S. 1291. 1903. Holotype: Collected by S. M. Bain, no. 77, Sept. 1892. Jackson, Madison County, Tenn. (NY); isotype (?), (US).

Helenium Godfreyi Fern. RHODORA **45:** 494. 1943. Holotype: Collected by Godfrey & Tryon, no. 586, 14 July 1939, Pineville, Berkeley County, S. C. (GH); isotypes (NY, UC, US).

Helenium floridanum Fern. RHODORA **45:** 494. 1943. Holotype: Collected by A. H. Curtiss, no. 6663, Fitzgerald, Hernando County, Fla. (GH); isotypes (BKL, MIN, MO, NY, UC, US); var. *aphanactis* on the label of *Curtiss 6663* is an unpublished name.

Perennial herb, stem developing from a rosette formed the previous season from the seedling or as an offset from the short caudex; caudex with coarsely fibrous roots and often with the persistent fibrous leaf bases of prior rosettes. Plant erect, 0.3–1.0 m. high, single-stemmed, usually *profusely branched*, each branch bearing several small heads and quite often bifid toward the apex. While the growth is of a determinate type, with each branch terminated by a head, the successive branches develop basipetally from the upper leaf axils, and while the heads are formed in a like manner on each branch, the over-all pattern of the inflorescence is of the type commonly termed *paniculately-branched.* Heads usually very many, with the depauperate plants having fewer in number, rarely reduced to one. Stems sulcate, *pubescent,* winged below, becoming striate and more broadly winged above and within the branching portion, with the wings sometimes over 5 mm. wide and the pubescence usually becoming more fine and incurved. Peduncles striate, *with short incurved pubescence,* more or less uniform in length and becoming enlarged at the base of the involucre and fistulous, especially at maturity. *Leaves with various degrees of pubescence below,* ranging from glabrate to rather densely hairy, the upper leaves usually pubescent with short and somewhat incurved hairs. Leaves prominently uninerved, lateral nerves obscure, impressed-punctate, resin-atomiferous, gradually reduced upwards. Radical leaves linear-lanceolate, elliptic-lanceolate, oblanceolate to

spathulate, usually intact and present on those plants collected early in the season only; margin ranging from entire to pinnatifid-incised; apex obtuse to acute, the basal portion tapering somewhat but *not petioloid*, re-expanding within the rosette so as to be somewhat clasping; 3.0–21.0 cm. long, 0.4–3.0 cm. wide. Cauline leaves becoming reduced upwards, becoming more linear-lanceolate upwards, *not petioloid*, but decurrent along the stem so as to form a manifest wing; lower ones denticulate, but soon becoming entire; the upper bracteate leaves lanceolate to linear-lanceolate, entire decurrent, more remote and often with extremely reduced bracts scattered along the peduncle. Involucre biseriate, the outer series exceeding the inner one and not so deeply parted, forming a slight cupule at the base; phyllaries linear-lanceolate, pubescent, acute to acuminate, becoming reflexed including the cupule-like portion of the base at anthesis, 0.4–0.7 cm. long, 1.0–2.0 mm. wide at the base. *Heads subglobose to globose;* occasionally somewhat conic; receptacle subglobose to decidedly conical. Ray florets neutral; ligules yellow, umber, suffused with red or deep purple or ligules absent entirely in some plants, resin-atomiferous, pubescent below, 1.0–2.1 cm. long; achenes abortive and less than those of the disk in length. *Disk red-brown to red-purple in color*, 0.7–2.0 cm. wide, 0.5–1.5 cm. high; disk florets fertile; corolla 2–3.0 mm. long, glandular-pubescent on the lobes, *predominently 4-merous (both lobes and stamens)*, red-brown to red-purple tipped, cylindric to cylindric-campanulate in shape with a short basal tube, resin-atomiferous; pappus scales 5 (–8) in number, rigid, *lanceolate*, usually *acute* at the apex so as to form an *awn, the costa more or less manifest*, margins serrate to a degree, 0.4–1.5 mm. long; achenes hairy-pubescent on the ribs, resin-atomiferous, 1.0–1.5 mm. long, columnar to truncate-turbinate in shape.

DISTRIBUTION: Plants of various provinces of the eastern United States, from just east of the Great Plains to the eastern seaboard; a weedy plant apparently extending its range northward and eastward and seemingly capable of survival in a variety of habitats; occurring in prairies, flat-woods, pine barrens, borders of ponds and stream banks, low moist woods, open areas of the Appalachians, savannahs, pocosin margins, roadsides, old fields and moist low meadows and roadside ditches; from eastern Texas northward into Missouri and Illinois and thence eastward to the Atlantic seaboard, Florida to Maine. (Map 3)

REPRESENTATIVE SPECIMENS.—**Texas.** Bowie Co.: 3 m. W. of Noah, *Cory 56009* (NDA, OKLA, SMU, US, WS). Jasper Co.: 8 m. S. of Kirbyville, *Shinners 7675* (ARIZ, GH, SMU, UC). **Arkansas.** Garland Co.: Hot Springs, 5 Aug. 1879, *Letterman s.n.* (BKL, F, MIN, MO, NY, PH, TEX, UARK, US). Leflore Co.: near Page, *Blakely 1438* (DS, GH, MIN, MO, OKLA, US). **Oklahoma.** Adair Co.: 6 m. S. of Ballard, *Waterfall 10194* (ARIZ, OKLA, RSA, SMU, TAES). **Missouri.** Ripley Co.: Pleasant Grove, *MacKenzie 242* (COLO, F, MIN, MO, NY, PH, RM, US). **Tennessee.** Obion Co.: near Walnut Log, Reelfoot Lake, *Eyles & Eyles 131* (FLAS, GH, MO, NY, OKL, OKLA, OSC, PENN, TENN, REX, UC, WIS, WS, WVA). **Kentucky.** Lyon Co.: Kuttawa, *Eggleston 5179* (GH, MIN, MO, NY). **Illinois.** Clinton Co.: Carlyle, *Buckley s.n.* (GH, NY). **Indiana.** Morgan Co.: Sycamore Creek, *Friesner 14816* (DUKE, GA, GH, NY, UC, WS, WVAS).

Switzerland Co.: 1.2 m. E. of Fairview, *Friesner 23581* (FLAS, NCSC, SMU, TEX). **West Virginia.** Upshur Co.: Sago, 15 Aug. 1947, *Grose & Grose s.n.* (FLAS, GA, GH, IA, NCSC, OKLA, OSC, PENN, SMU, TEX, UC, WS, WVA). **Louisiana.** Rapides Parish: vicinity of Alexander, *Ball 506* (F, GH, MIN, MO, NY, US). **Mississippi.** No county indicated or determinable: Westfield, *Tracy 8669* (F, GH, MIN, MO, NY, PENN, TAES, US, WIS). **Florida.** Duval Co.: Jacksonville, *Lighthipe 559* (BKL, GH, MIN, NDA, NY, RM, WIS). Hillsborough Co.: Tampa, *Curtiss 1520* (BKL, F, IA, MIN, NCSC, NY, PH, US). **Georgia.** Rabun Co.: Tally Mtn. Creek, *Duncan 10139* (FLAS, GA, GH, IA, MIN, MO, NCSC, NDA, SMU, TEX, UC). **South Carolina.** Georgetown Co.: 4 m. W. of Georgetown, *Godfrey & Tryon 124* (DUKE, F, GH, NY, PENN, TENN, UC, US). **North Carolina.** Hertford Co.: 2 m. N. of Murfreesboro, *Godfrey & Fox 49667* (DUKE, GH, MIN, WS). Macon Co.: Horse Cove, near Highlands, *Godfrey 51366* (MIN, NY, OKL, OKLA, PENN, SMU, TEX, UC). **Virginia.** Greensville Co.: NE. of Emporia, *Fernald & Long 10451* (GH, NY). **Pennsylvania.** Chester Co.: 1¼ m. S. of Ercildoun, *Fogg 5760* (GH, PENN, TENN). **New Jersey.** Burlington Co.: 1½ m. E. of Red Lion, *Fogg 9137* (PENN). **New York.** Westchester Co.: Tibbet Brook Park, Yonkers, *Monachino 104* (BKL, DUKE, TENN, NY). **Connecticut.** Middlesex Co.: Killingworth, *Weatherby 5438* (NEBC). **Massachusetts.** Berkshire Co.: Great Barrington, 20 July 1920, *Hoffman s.n.* (NEBC). Plymouth Co.: Duxbury, 6 Oct. 1902, *Bond s.n.* (NEBC). **Vermont.** Windsor Co.: Woodstock, 27 Aug. 1938, *Kittredge s.n.* (GH, NEBC). **New Hampshire.** Carroll Co.: Wonalancet, Aug. 1914, *Terry s.n.* (NEBC). **Maine.** York Co.: N. Berwick, Aug. 1896 *Parlin s.n.* (MIN, NEBC).

In the *Synoptical Flora* of 1884, Asa Gray justly considered the applicable binomials extant at that time to be mere variants and treated *Helenium flexuosum* as a single, polymorphous species. Subsequent to Gray, three taxa have been segregated from *Helenium flexuosum* and described as new species. The first of these, *H. polyphyllum* Small, was given specific status purely on the basis that the upper branches were more widely winged (2 mm. wide or more) and that the plant was finely pubescent as opposed to puberulent and wings of the upper branches less than 2 mm. wide. Rydberg maintained Small's *H. polyphyllum* as a species co-existent with *H. flexuosum* in the more western and southwestern part of the latter's range, rather than as the Tennessee-Georgia endemic of Small. Fernald has rightly stated (RHODORA **45:** 493. 1943) that both can be maintained as separate species: "Only by recognizing the smallest specimens with narrowest cauline wings as the former [*H. flexuosum*], the largest ones with the broadest wings as the latter [*H. polyphyllum*], ignoring the large series of transitional specimens . . ." Indeed, from the author's own experience of growing members of this taxon in the greenhouse, both forms of the wing occur in plants collected in the same

locality, plants that grew so close together in the wild that they probably originated from achenes shed from the same head. The author is convinced that very little value can be attached to "finely pubescent" in contrast to "puberulent" as a taxonomic character at the specific level in this variable species. On the basis then of the widespread series of intergrades as well as because these intergrades occur within the same colony of plants no taxonomic recognition is here afforded to *H. polyphyllum.*

Professor Fernald, after taking Rydberg to task for maintaining *H. polyphyllum* as distinct from *H. flexuosum*, proceeded to give specific status to two other forms of *H. flexuosum* that he considered worthy of such recognition (Rhodora **45:** 494. 1943.) Fernald recognized these two, *H. Godfreyi* and *H. floridanum*, stating: "in our Southeast there are two extremes, native of low woods and swamps and evidently local endemics, which seem to be really well defined species."

Helenium Godfreyi was characterized as having blunt and awnless pappus scales, which also were either round or oval and from 0.4 to 1.4 mm. in length. In the formal latin diagnosis the achenes are described as "glabris verrucosis," and Plate 799 of the article in *Rhodora* contains an inset of the glabrous achene and pappus scales. In at least two of the isotypes of this binomial, however, the pappus scales are decidedly acute if not acuminate. Collections made by the author in the same area as the type locality of *H. Godfreyi* have shown upon examination that not only do both forms of the pappus scale, blunt and acute, occur in the same population but that some specimens had both forms within the same head. Similar collections from nearby counties in South Carolina and North Carolina all show that there is a tendency in these areas toward a blunt and awnless pappus in a number of the specimens. However, such a tendency has been witnessed in other populations of *H. flexuosum* well away from the Carolina Coastal Plain in Indiana, Missouri and Arkansas. Moreover, the more typical acute and awned pappus scale is encountered in specimens of *H. flexuosum* quite regularly from North and South Carolina.

Without actually destroying the utility of the type specimen,

a positive statement cannot be made but the author seriously doubts the existence of another glabrous achene within the heads of the type specimen. A few disk florets were removed from each head where it was possible to do so (8 heads in all) and there was not a single glabrous achene among those removed nor were there any in those of the isotypes examined.

Helenium floridanum "concentrated in the northern half of Florida" is distinguished from *H. flexuosum* according to Fernald by the "ovate pappus pales . . . rounded at tip and terminated by a very long, filiform and smoothish awn . . . [and] in this plant the relatively small heads are either rayless or with well developed ligules." Unfortunately, the pappus scale characters cited as being differential are in no way different from those of the pappus scales of specimens of *H. flexuosum* from Texas, Illinois, Mississippi, Pennsylvania or Maine. The "relatively small heads" is hardly of any taxonomic importance or descriptive specificity in distinguishing taxa within *H. flexuosum* proper. The head size is a variable character in this species, seemingly dependent to some degree on environmental conditions, even in the "northern half of Florida." The author suspects that the rayless condition of some of the specimens from Hillsborough and Hernando Counties, Florida prompted the publication of *H. floridanum* more than anything else. However, this rayless condition cannot be correlated with any other morphological character nor is it constant, there being specimens with some heads rayed and other heads rayless. In addition, the rayless character of some of the specimens of *H. flexuosum* occurs in other parts of the range of the species, notably Texas.

In this treatment, on the basis of the examination of over 1,500 specimens of *H. flexuosum* from Texas to Maine, no taxonomic recognition in a formal sense is given to *H. Godfreyi* and *H. floridanum* either within or apart from *H. flexuosum* and at most they are considered to represent population differences of relatively small importance within the species as a whole. Viewed throughout its entire geographical range, *H. flexuosum* is a rather variable taxon, especially in relation to the other members of the vernal group of species of *Helenium*. Such variability is not unexpected in a wide-ranging and weedy

species that presumably is not an apomict. The means by which *H. flexuosum* may be distinguished from the other vernal taxa, as well as speculations concerning its origin and history, have been pointed out and suggested in that part of this paper which discusses relationships and there remains no need for repeating them here.—GRAY HERBARIUM, AND ARNOLD ARBORETUM, HARVARD UNIVERSITY.

Range Extensions in the Genus Peteria (Leguminosae).[1] Since the publication of my treatment of the genus *Peteria*,[2] several persons have been kind enough to call my attention to collections which I had not seen and which extended the range of two species as mapped in that paper, and to one additional collection of a third species. In order to amplify the previous treatment, the following notes are presented.

I am indebted to the following persons for the loan of the specimens cited: Dr. Rimo Bacigalupi, the Jepson Herbarium, University of California (JEPS); Dr. Ray J. Davis, the herbarium of Idaho State College (IDS); and Dr. William H. Baker, herbarium of the University of Idaho (ID).

Peteria Thompsonae S. Wats. This plant is known to have a range extending into southwestern Idaho, Owyhee County: Hot Springs, June 1, 1945, *Ripley & Barneby 6511* (IDS); 12 miles south of Bruneau, June 10, 1947, *J. H. Christ 16,715* (ID); 13 miles south of Bruneau, June 21, 1956, *W. H. Baker 14,023* (ID); Hot Springs Falls, June 27, 1953, *Sharp Tisdale, Fosberg, & Helle*, s.n. (ID).

Peteria scoparia A. Gray. Known from southwestern Colorado, Montezuma County: Mesa Verde, June 1875, *T. S. Brandegee 1103* (JEPS).

Peteria glandulosa (A. Gray) Rydb. An additional collection of this species has been seen: Esperanza, Puebla, Mexico, *C. A. Purpus 2474* (JEPS).—C. L. PORTER, UNIV. OF WYO., LARAMIE.

[1] Contribution from the Department of Botany and the Rocky Mountain Herbarium, University of Wyoming, No. 229.

[2] Rhodora **58**: 344–354. 1956.

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PINGUICULA (LENTIBULARIACEAE) IN THE SOUTHEASTERN UNITED STATES

C. E. Wood, Jr. and R. K. Godfrey[1]

Four distinctive species of the insectivorous genus *Pinguicula* L. have long been recorded from the southeastern United States. All are members of subgenus Isoloba (Raf.) Barnhart, a group represented outside of this area by *P. lusitanica* L., of Atlantic Europe and northwestern Morocco, and about six species of South America. Three of the species of the Southeast, *P. caerulea* Walt., *P. lutea* Walt., and *P. pumila* Michx. are of fairly widespread occurrence on the outer portions of the Coastal Plain. *Pinguicula pumila,* with the widest range of all, occurs from southeastern North Carolina to southernmost Florida and the Bahamas and westward to central Louisiana and eastern Texas. The fourth species, *P. planifolia* Chapman, a much less well known plant, centers primarily around the Apalachicola River, in western Florida, but also has been collected westward to Mississippi near the coast.

In the course of extensive field work in western Florida, a conspicuous fifth species, which proves to be undescribed, has been collected in a number of localities by Godfrey. It has subsequently been found to occupy a range from southwestern Georgia and western Florida to southern Mississippi

[1] One of a series of miscellaneous notes and papers arising from researches on the flora of the southeastern United States made possible by a grant from the National Science Foundation and by the interest and support of George R. Cooley in this area. A part of the work of the junior author which contributed to this paper was made possible by National Science Foundation Grant G2010 and a grant-in-aid from the Research Council of Florida State University. Earlier papers in this informal series were R. B. Channell, Reappraisal of two plumose Rhynchosporas of the southeastern United States, Rhodora 58: 335–343. 1956; C. W. James, Notes on the cleistogamous species of *Polygala* in southeastern United States. Rhodora 59: 51–56. 1957, and A new variety of *Stipulicida setacea*. Rhodora 59: 98. 1957.

and to have been confused variously in this area with *P. caerulea*, *P. planifolia* and *P. pumila*. Field and herbarium studies of this and the other species of the Southeast show, however, that the undescribed plant is quite distinct from those previously described both in its morphology and ecology.

In the field, the new species immediately attracts attention not only by its characteristic and showy corolla but by its oc-

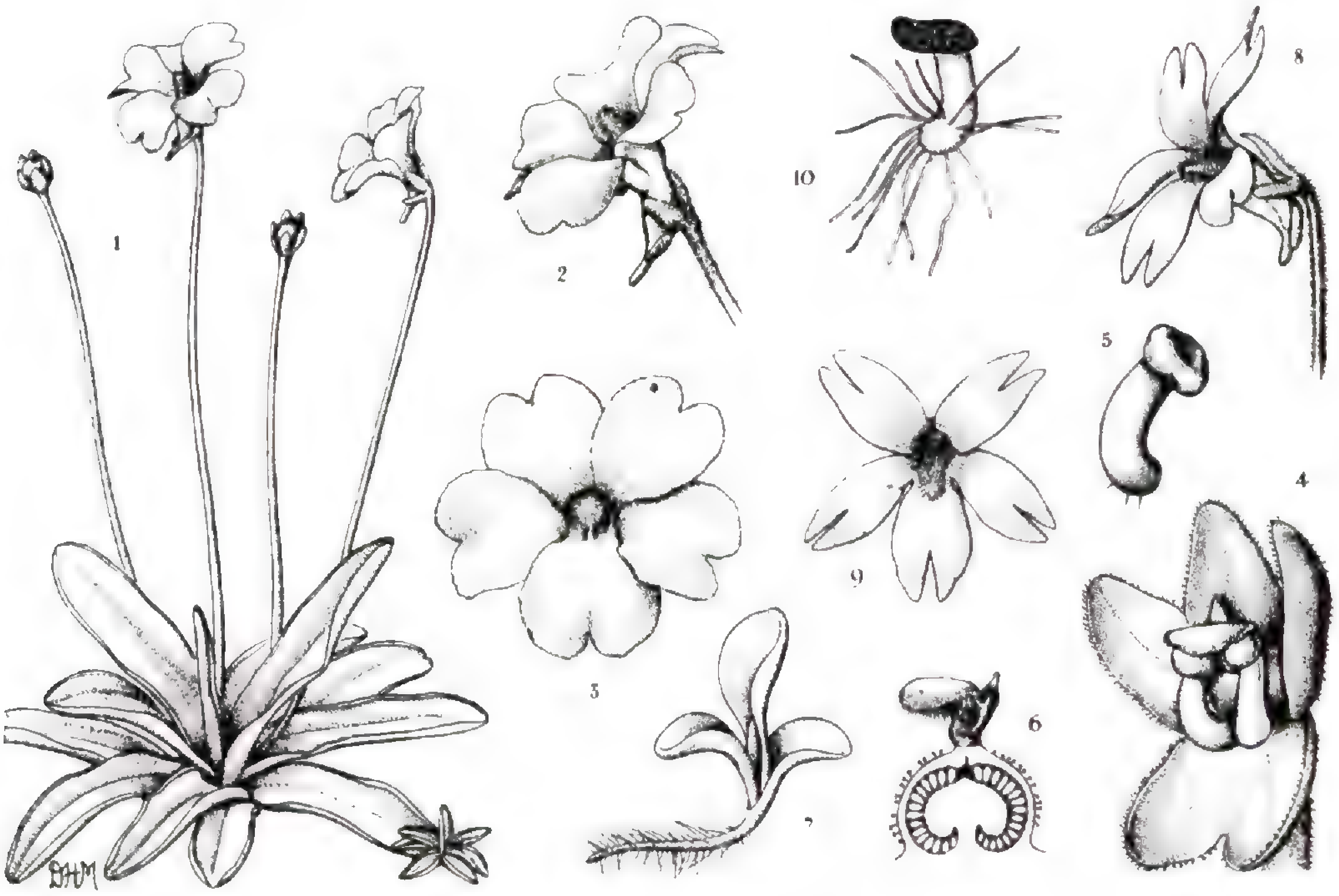

Fig. 1–7. Pinguicula primuliflora, Escambia Co., Fla. (see *Godfrey 54599*). 1. Habit, × ½. 2, 3. Lateral and face-views of corolla, × 1. 4. Calyx, stamens and pistil, × 4. 5. Stamen, × 6.6. Pistil, the ovary sectioned to show free-central placentation (semi-diagrammatic); note two-lobed stigma with pollen-holding hairs on underside of larger lobe, × 6. 7. Seedling, with primary root, hypocotyl, single cotyledon and two leaves, × 5. Fig. 8–9. P. planifolia, Gulf Co., Fla. Corolla, two views, × 1. Fig. 10. P. lutea, Fla., young seedling, with seed-coat, anchoring ring of "root-hairs" at base of hypocotyl, the primary root as yet undeveloped, × 10. Drawings by Dorothy H. Marsh.

currence in habitats unusual for *Pinguicula* in the Southeastern States. In western Florida it occurs mostly in the shade of evergreen shrubs or trees in areas with *Sphagnum* or *Pallavicinia*, along spring runs or in springy places, almost always where there is flowing water. In southern Mississippi it seems likewise to be associated, for the most part, with moving water. Dr. R. B. Channell, now of Vanderbilt University, has observed and collected the plant in George and Stone counties, where he found it occurring in grassy tussocks, on the bases of *Nyssa*

saplings, and on mill-timbers, in association with *Orontium* or *Nymphoides* growing in clear, flowing water. Some specimens were collected in moist, sandy soils in pinelands but it may be remarked that these plants are less well developed than those from wetter localities. Dr. James D. Ray kindly visited some of Dr. Channell's localities and others and sent living plants, along with further ecological notes, in the spring of 1957 and has also sent specimens of this species from the herbarium of Mississippi State College. In Stone County, Dr. Ray found the plant associated with *Eriocaulon*, *Lachnocaulon*, *Drosera*, *Helenium brevifolium*, *Selaginella*, and *Mayaca* in the wet, grassy margin of a roadside ditch along the margin of a pine-mixed hardwood thicket (*Ray 8020*). In Harrison County he reports the plant as local, forming tussocks with *Sphagnum* and *Mayaca* around the bases of *Nyssa biflora* in a shallow pool with an overstory of *Magnolia*, *Ilex*, *Kalmia*, *Viburnum* and *Rhus Vernix* in a second-growth pine wood (*Ray 8031*).

In contrast to this general ecological picture, *Pinguicula caerulea*, *P. lutea*, and *P. pumila* favor moist to wet, sandy localities, primarily in pine-barrens and savannas. *Pinguicula planifolia* grows in the shallow water of pond-margins or ditches, *Sarracenia* bogs and "flatwoods" depressions, usually with the rosettes submerged (an interesting ecological divergence for a member of this insectivorous genus). In each of these instances, the plants generally grow fully exposed to sun in areas where any surface-water is standing water. In spite of its general association with moving water, the new species, described below, flourishes in *Sphagnum*-filled pots standing in water, a rewarding feature which has made possible the examination of the plant at leisure and in some detail.

Pinguicula primuliflora Wood and Godfrey, sp. nov.

Pinguicula rosulata crenicola saepe sphagnicola subgeneris Isolobae (Raf.) Barnhart. Folia viridia oblonga, basi spathulata, apice rotundata, (2.5–)6–9 cm. longa, (1–)2–2.5 cm. lata. Scapi 8–15 cm. longi. Sepala 5, 2 infima semicoalita, 2 lateralia oblonga vel ovata, 4–5 mm. longa, 2–3 mm. lata. Corolla (in sicco) (15–)20–26 mm. longa; lobi corollae violaceo-caerulei basi albi, obovati vel suborbiculares aequi, (8–)10–13 mm. longi, 2–3 mm. lati, apice emarginati crenis (1.5–)2–3 mm. profundis; tubus flavus venis brunneis, 4–5 mm. longus, palato conspicuo conico-aciculari, 4–6 mm. longo ex tubo (3–)4–5 mm. exserto. Calcar subcylindricum

flavum, (3–)4–5 mm. longum. Stigma album bilobatum, lobus inferior major. Capsula depresso-globosa, 5 mm. diametro, bivalvata. Semina numerosa subcylindrica, truncata, brunnea, 0.5–0.7 mm. longa.

A *Pinguicula* of subgenus Isoloba (Raf.) Barnhart. Flowering rosettes 4 16 cm. wide, the leaves oblong, spatulate at the base, rounded at the tip, (2.5–)6–9 cm. long, (1–)2–2.5 cm. wide. Scapes 1-flowered, ebracteate, 8–15 cm. long at flowering. Flowers (pressed) ca. (15–)20–26 mm. long, including the spur. Sepals 5, the 3 upper free to the base, the lower united about ½ their length, the lateral sepals oblong to ovate, 4–5 mm. long 2–3 mm. wide. Corolla with nearly equal broadly obovate (or obovate) to suborbicular lobes (8–)10–13 mm. long, 10–14 mm. wide, shallowly notched (1.5–)2–3 mm., widespreading in sunlight, often overlapping, the limb then 15–30 mm. wide. Tube subcylindric, compressed somewhat dorso-ventrally 4–5 mm. long (along the lower side), (3–)4–5.5 mm. wide in pressed specimens, with a conspicuous conic-acicular palate ca. 4–6 mm. long at the base of the lowermost corolla lobe and exserted (3–)4–5 mm. from the mouth of the tube. Corolla tube abruptly contracted into the cylindric spur (3–)4–5 mm. long, forming an angle of 45–60 degrees with the tube. Outer ¾ of corolla lobes wisteria-violet (Ridgway) to almost white, white at the base, the tube lemon-yellow veined with Brussels brown, especially on the upper side, the spur yellow or with brown veins. Palate densely bearded with slender lemon-chrome clavate-tipped multicellular hairs; throat of tube behind palate with yellow to red smooth, short-stalked, flattened, pyriform or mitten-shaped multicellular hairs. Stamens 2, the anthers pale, the filaments white, the pollen nearly white. Ovary subglobose, glandular, the stigma white, unequally 2-lobed, the lower, larger lobe curving over the anthers. Capsule depressed-globose, ca. 5 mm. in diameter, 2-valved; seeds numerous, minute, 0.5–0.7 mm. long, subcylindric-truncate, brown, the testa of smooth, thick-walled nearly isodiametric cells. (Fig. 1–7, 11–14, 30.)

Specimens examined: **Georgia.** Early Co.: acid bog, 2 mi. s. of Hilton, *Thorne 2919 & Muenscher*, 10 Apr. 1947 (gh). **Florida.** Escambia Co.: on banks of stream, at very edge of water, and amongst *Sphagnum* in shrub bog, Bayou Marcus Creek, west of Pensacola, *Godfrey 54599*, 26 Mar. 1956 (fsu, gh). Franklin Co.: common, open moist sands of shrub-bog–savanna, 15 mi. n. e. of Eastpoint, *R. Kral 4037a*, 9 Feb. 1956 (fsu). Liberty Co.: several plants on wet sands along margin of railroad ditch, shrub slash-pine bog, 6 mi. n. of Vilas, *Kral & Godfrey 1960*, 26 Feb. 1956 (fsu). Okaloosa Co.: many plants in shallow water of and on the banks of spring-run, in dense bay-swamp, 1 mi. e. of Crestview, *Godfrey 54553*, 25 Mar. 1956 (fsu, gh). Santa Rosa Co.: in sphagnous evergreen shrub bog, 3 mi. e. of Jay, *Godfrey 54540*, 25 Mar. 1956 (fsu, gh). Walton Co.: in shallow running water, intermixed with *Sphagnum*, in branch-bay woodland, ca. 12 mi. s. of De Funiak Springs, *Godfrey 54408*, 5 Mar. 1956 (fsu, gh); very abundant in shallow running water all over a springy, swampy woodland, intermixed with *Sphagnum*, at Cluster Springs, *Godfrey 54416*, 4 Mar. 1956 (gh-Type; fsu), *Godfrey & Harrison 55396*, 7 Mar. 1957 (fsu, gh); common in sun, fluvial swamp,

6 mi. n. of Portland, *Tyson 694*, 4 Mar. 1952 (GH). **Mississippi.** George Co.: growing on clumps of grass in the edge of Cedar Creek at Miss. Route 63, *Channell*, 2 Aug. 1953 (sterile plants) (GH); mud flats of Cedar Creek, Agricola, *Demaree 34674*, 21 Feb. 1954 (GH); Cedar Creek, not far from Agricola, *Cootey 3399*, *Pease & Demaree*, 3 Apr. 1955 (MISSA). Harrison Co.: Lyman Bog, *Cooley & Ray 3225*, 19 March 1955 (GH, MISSA); local, around base of *Nyssa biflora* in shallow pool, in secondary pine wood, 1 mi. n. of Airey, 3 mi. e. of Saucier, *Ray 8031*, 20 Apr. 1957 (GH, MISSA). Jackson Co.: swampy grass field, ½ mi. n. of Harleston, *Diener 838* (MISSA). Stone Co.: occurring with Goldenclub [*Orontium*], on little knolls in stream and along its edge, among clumps of grass, cool, fresh mill-stream, between Hattiesburg and Wiggins, Highway 45, *Channell*, 9 Apr. 1951 (MISSA); fast moving streams, Wiggins, *Brown*, 1 Apr. 1950 (MISSA); low, moist pinelands in sandy soil, 15 mi. e. of Perkinston, *Channell*, 27 Mar. 1951; floor of pine forest, sandy soil, University Forest Lands, near Perkinston, *Channell*, 4 Apr. 1951 (MISSA); margin of roadside ditch along margin of pine–mixed hardwood thicket, near McHenry, south of Perkinston, *Ray 8020*, 20 Apr. 1957 (fl. and mature fruit) (GH, MISSA). All collections flowering, unless otherwise noted. (Abbreviations for herbaria are those of Lanjouw and Stafleu, Index Herbariorum, Part I, ed. 3, 1956.)

Pinguicula primuliflora is readily distinguished by the habitat, the oblong leaves, the blue-white-yellow pattern of the corolla, the well-exserted conic-acicular palate, the characteristic form of the fleshy hairs in the throat of the corolla, the widespreading, shallowly notched corolla-lobes, the relatively narrow and short tube, and the spur 4–5 mm. long. Undersized specimens which bear small flowers may be confused with *P. pumila* but the exserted palate and the very different hairs on the palate, at its base, and on the walls of the corolla-tube will immediately distinguish such specimens. The short spur apparently has resulted in confusion with *P. planifolia* but in that species the spur is only 2–3 mm. long, almost sac-like, the corolla is violet to almost magenta with a darker tube, the corolla-lobes are deeply cleft into two acutish segments, and the hairs in the throat of the corolla are quite different.

In the course of working out the characteristics of *Pinguicula primuliflora* a number of observations have accumulated which suggest additional bases for future investigations in the genus. Unfortunately, with much of the *Pinguicula* material (including types) accumulated by the larger herbaria having been destroyed in Berlin during World War II, work on the genus as a whole will be difficult. Enough material is available to us, however,

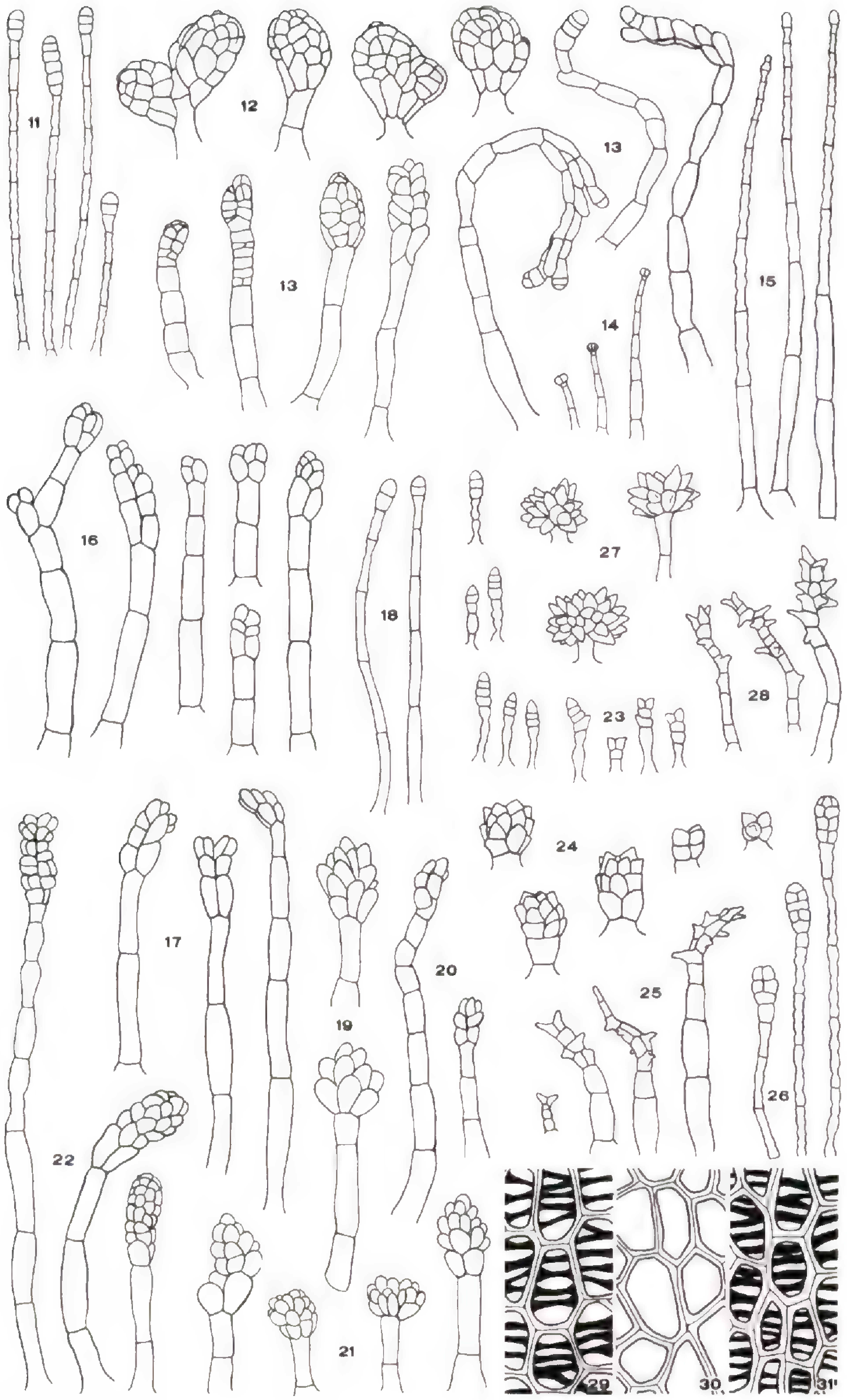

Fig. 11–31. Corolla-hairs and seed-coats of Pinguicula. Fig. 11–14. P. primuliflora, *Godfrey 54599*, Escambia Co., Fla. 11. Four hairs from palate. 12. Four hairs from base of palate on floor of corolla-tube. 13. Seven hairs from lateral walls of corolla-tube. 14. Three glandular hairs from floor of corolla-tube near base

to show a number of interesting features in those species which occur in the southeastern United States.

Most of the taxonomic characteristics reside within the elaborate corollas which appear to be adapted to pollination by bees or flies. The varying flower-colors, the size of the corolla-lobes, the diameter and length of the tube, the length of the spur, are all features, useful in taxonomy, which must play important roles in the floral biology of each species. Even more interesting is the palate (a conspicuous structure in this subgenus) of varying size and clothed with hairs of varying length, structure, and color, which apparently serve as foot-holds for the insect visitor. Directly behind the palate on the floor of the corolla-tube is a series of yellow to red shortened, enlarged multicellular hairs. The function of these hairs is not known: although succulent in the living flower, they do not appear to be secretory. Though lacking in *P. caerulea*, they are of distinctive form in each of the four species in which they occur, thereby providing excellent taxonomic characters. Along the lateral walls of the tube are still other multicellular hairs, varying in shape and structure, and also of unknown significance in the functioning of the corolla. (See fig. 11–28.) The characteristic shapes of the hairs are frequently distinguishable even in carefully opened dried corollas and all may be readily observed in corollas which have been re-expanded by soaking or boiling.

The pollination of *Pinguicula alpina* L. and *P. vulgaris* L. (both of subgenus PIONOPHYLLUM A. DC.) has been described by Müller (1881; see also Knuth, 1906, p. 133 and 1909, p. 235), who noted the functioning of hairs within the corolla in connection with the pollination of *P. alpina* by flies and that of

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of spur. Fig. 15–17. *P. caerulea, Wood,* 1956, Carteret Co., N. C. 15. Three hairs from palate. 16. Six hairs from walls of tube. 17. Three hairs from base of palate. Fig. 18–20. P. LUTEA, *Godfrey 52981 & Almodover,* Franklin Co., Fla. 18. Two hairs from palate. 19. Two hairs from base of palate. 20. Two hairs from walls of tube. Fig. 21–22. P. LUTEA, *Channell 2808,* Columbus Co., N. C. 21. Four hairs from base of palate. 22. Three hairs from walls of corolla-tube. Fig. 23–25. P. PUMILA, *Godfrey 54483 & Kurz,* Franklin Co., Fla. 23. Eight hairs from palate. 24. Five hairs from base of palate. 25. Four hairs from walls of tube. 26–29. P. PLANIFOLIA, living plants, *Godfrey,* Gulf Co., Fla. 26. Three hairs from palate. 27. Three hairs from base of palate. 28. Three hairs from walls of tube. 29. Cells of seed coat. 30. P. PRIMULIFLORA, cells of seed coat. 31. P. CAERULEA, cells of seed coat.

P. vulgaris by bees. The flower of the former species is of the pinch-trap type with a zone of inwardly directed bristles behind two conspicuous yellow sacs which ornament the entrance to the corolla-tube. The hairs hinder the easy exit of flies visiting the flowers and bring about the contact of the back of the fly with the anthers. The stiff hairs which grasp the body of the fly occasionally imprison the insect within the tube. Although floral biology of the Southeastern species has not been studied, it appears that insects may become trapped occasionally, for on one herbarium specimen of *Pinguicula lutea* a well-pressed one-centimeter-long bee is inclosed within the corolla! The pollination and floral biology of these species should be a fascinating field for further investigation.

In this genus, the precise use of floral characteristics for taxonomic purposes will call for more attention on the part of collectors. The one-flowered scapes of *Pinguicula* mitigate against the dissection of herbarium materials except in cases in which extra corollas have been provided specifically for that purpose. Most pressed flowers are distorted or pressed helter-skelter, while little or no information is given on the original color pattern of the corolla. Although the latter may be obvious in recently collected specimens, the colors inevitably fade with time. It is highly desirable to have additional well-pressed corollas, some spread open to show the palate and the interior of the tube, as well as the lobing of the corolla. Plants of *Pinguicula* are indeed somewhat discouraging subjects for the preparation of herbarium specimens, having as they do slimy, fleshy, brittle leaves which tend to recurve when the tightly packed rosette is dug from the ground. Although the fresh plant is bulky, the leaves dry to fragile tissue-thinness. The use in pressing of wax-paper with the leaves and of cleansing or facial tissue with the flowers will produce excellent results, however.

Although size-measurements are useful in distinguishing between the various species, Pinguiculas have the distressing feature of flowering either as small or large plants with the corollas varying accordingly in size. In *P. primuliflora* the limb may vary from 15 to 35 mm. across, the smaller flowered specimens overlapping with *P. pumila* in flower-size. In general,

the length of the spur and that of the palate are less variable (even in small flowers), but even here occasional measurements may overlap in several species.

With most of the taxonomic characters based upon the conspicuous corolla, the less striking and not certainly identifiable fruiting specimens are seldom collected. The seeds, more or less similar in appearance, are all brown, minute (mostly about 0.5 mm. long), and with a seed coat of large, thick-walled cells which produce a reticulate surface. In *Pinguicula caerulea*, *P. lutea*, *P. pumila*, and *P. planifolia* the inner and lateral walls of the cells are thickened only in bands reminiscent of secondary thickenings of xylary elements. The absence of such thickenings in *P. primuliflora* provides another means of distinguishing this species. (See fig. 29–31.)

In connection with the biosystematics of the species occurring in the Southeast, it may be noted that, although two or three species may grow in the same vicinity, there is no evidence of hybridization. All of our species are normally cross-pollinated, abundant seed being set in the wild, but are self-fertile when artificially pollinated. Although *P. primuliflora* readily matures seeds in cultivation, artificial pollination of this species with *P. planifolia*, *P. lutea* and *P. pumila* has resulted in each instance in seeds which either abort before maturity or fail to germinate. Artificial hybrids between members of subgenus ORCHEOSANTHUS A. DC., of Mexico, have been reported however, and two naturally occurring hybrids between species of subgenus PIONOPHYLLUM A. DC., have been described from Europe. The sterile *P.* × *Scullyi* Druce occurs rarely where the closely related *P. grandiflora* Lam. ($2n = 64$) and *P. vulgaris* L. ($2n = 64$) come together. *Pinguicula* × *hybrida* Wettst. is morphologically intermediate between *P. alpina* L. ($2n = 32$) and *P. vulgaris* L., and is also sterile, as would be expected.

The only other chromosome-number reported from the genus is that of *P. villosa* L. ($2n = 16$) (Knaben, 1950)[2], a diminutive arctic species, also of subgenus PIONOPHYLLUM. The polyploid

[2] Áskel Löve has obligingly called our attention to this count and to that for *P. bicolor* Woloszczak, $2n = 64$ (Zurzycki, J. Studies in Pinguicula-species occurring in Poland. Frag. Flor. & Geobot. [Krakow] **1**: 16–31. 1953), which was inadvertently omitted. To the numbers included here should also be added that reported by Heitz (Zeitschr. f. Bot. **18**: 652. 1925) for "*P. caudata*," $2n = 44$, a member of subgenus ORCHEOSANTHUS.

series of 16, 32, 64 now known from this subgenus (Löve, & Löve, 1944; Doulat, 1947; Knaben, 1950) indicates that counts of other species should be of considerable interest.

The species of the southeastern United States may be distinguished by the following key:

a. Scapes villous below with long, non-glandular hairs; palate broad, densely clothed with pale hairs; corolla-tube without short, enlarged fleshy hairs at the base of the palate within; corolla-limb violet-blue, the tube greenish, conspicuously ventricose, (6–)7–11 mm. wide (pressed), veined with deep violet, the spur greenish, 5–8 mm. long. . . . . 1. *P. caerulea.*

a. Scapes not villous below, lacking long, non-glandular hairs; palate with bright yellow hairs; corolla-tube with enlarged, fleshy hairs at base of palate within.

b. Palate hardly or not at all exserted from the mouth of the corolla-tube, conical (obtuse in pressed specimens), ascending, about 2 mm. long, clothed with short hairs with obtuse to conical terminal cells; corolla, including spur, 15–20 mm. long, the tube 2–4 mm. wide (pressed), the lateral corolla-lobes (3–)5–7 mm. long, suborbicular, notched about 1 mm. or less, the spur 3–5 mm. long; corolla-limb lavender to white, pink or yellow, the tube violet or yellow . . . . 3. *P. pumila.*

b. Palate conspicuously exserted (usually 3–6 mm.) from corolla-tube, conic to conic-acicular, densely clothed with slender hairs with more or less clavate tips, the terminal cells rounded; corolla usually more than 20 mm. long.

c. Spur 2–3 mm. long, sac-like, greenish; corolla-lobes (9–) 12–16 mm. long, 7–10 mm. wide, cleft (5–)6–7 mm. into two equal obtuse to acutish segments, violet-blue to magenta, the tube a darker violet; corolla-tube 4–5 mm. wide (pressed), with druse-like stalked hairs of conical- to obtuse-tipped cells at the base of the palate. 4. *P. planifolia.*

c. Spur (3–)4–8 mm. long, cylindric, yellow; corolla-lobes obovate to orbicular, 8–15 mm. long, 7–16 mm. wide, usually broadly and shallowly notched 2–7 mm. into rounded segments (in No. 2 these segments sometimes more shallowly notched, in turn); cells of stalked hairs at base of palate with rounded tips.

d. Corolla chrome yellow, the tube 5–8(–10) mm. wide (pressed), the spur 5–9 mm. long; palate conical, the base with stalked hairs with enlarged tips of clustered, round-tipped cells . . . . 2. *P. lutea.*

d. Corolla-limb violet blue (to almost white), with a white zone at the base, the tube (3–)4–5.5 mm. wide (pressed), lemon-yellow with brown veins, the spur yellow, 4–5 mm. long; palate conic-acicular, the base with short-stalked, smooth, flattened-pyriform to two-lobed (or mitten-shaped) hairs . . . . 5. *P. primuliflora.*

1. **Pinguicula caerulea** Walt. Fl. Carol. 63. 1788.

P. elatior Michx. Fl. Bor.-Amer. **1:** 11. 1803.
Isoloba elatior (Michx.) Raf. Fl. Tellur. **4:** 59. 1838.

Distribution: Open, wet, sandy and peaty soils in pinelands and savannas on the outer Coastal Plain, southeastern North Carolina to southern Florida (about the latitude of Lake Okeechobee) and westward to about the Apalachicola River, the distribution almost coinciding with that of *Tephrosia hispidula* (Michx.) Pers. Flowering late February–early May.

Pinguicula caerulea stands somewhat apart from the four other species of our area. The pale violet-blue, veiny corolla with its expanded tube and very pale hairy palate is unlike the other species in the Southeast. The enlarged multicellular hairs which characterize all of the latter are lacking and even the hairs on the palate are unlike those of the others.

Walter's name, taken up by Barnhart (1933) in place of the long-used *P. elatior* Michx. appears to be the correct one for this plant. The question of a type-specimen is not clear, however. Although *P. lutea* Walt. is represented in the Walter herbarium (page 83) by a specimen easily recognized from a photograph, from the published illustration it is not so apparent to us that specimen No. 487, on page 104, is "readily matched (as to profile) by . . . a representative sheet of *P. elatior* Michx. (1803) . . ." as suggested by Fernald and Schubert (1948, p. 224 & pl. 113). The corolla of this unmistakable *Pinguicula* is in such a position that only a partial profile, which lends itself as well to *P. lutea* as to *P. caerulea*, can be seen. It is probably either one or the other, but only a careful examination of the specimen itself can determine whether or not *P. caerulea* is actually represented in Walter's herbarium.

2. **Pinguicula lutea** Walt. Fl. Carol. 63. 1788.

P. campanulata Lam. Jour. Hist. Nat. Paris **1:** 334. 1792.
P. edentula Hook. Exot. Fl. **1:** *t. 16*. 1823.
Isoloba lutea (Walt.) Raf. Fl. Tellur. **4:** 59. 1838.
I. recurva Raf. Fl. Tellur. **4:** 59. 1838. (An illegitimate renaming of *P. edentula* Hook.)

Distribution: Seasonally wet wire-grass and pine savannas of the Atlantic and Gulf Coastal Plains, from southeasternmost North Carolina to about the latitude of Lake Okeechobee, to southwestern Georgia, southern Alabama, southern Mississippi and eastern Louisiana. Flowering mid-February (in the south) to mid-May.

Plants from the Gulf Coast are often far larger, more vigorous and with correspondingly larger flowers than those of the Carolinas. The situation almost suggests that of *Drosera filiformis* and its more robust var. *Tracyi*, except that in this instance no differences other than size are evident nor is there a morphological break between specimens collected in the two areas. *Pinguicula lutea* is not easily cultivated, but the size-characteristics of Carolina and Mississippi plants are maintained at least through a second flowering season in cultivation.

Instead of being one-notched, the corolla-lobes of the species may be three-notched, a characteristic which occurs sporadically. The flower-color is constant and conspicuous, the only variation being in the presence or absence of brown venation in the corolla tube.

A characteristic worthwhile noting is that *Pinguicula lutea* frequently occupies somewhat drier habitats than the other species in our area. Blooming in spring, it may disappear during summer so that one suspects the existence of some method of aestivation (perhaps similar to the formation of winter buds in the boreal species), which permits the recurrence of growth in winter. Herbarium specimens give some indication of the production, under moist winter conditions, of leaves longer and more slender than those produced during the flowering period, thus suggesting somewhat the seasonally dimorphic leaves of some Mexican species of the genus.

3. **Pinguicula pumila** Michx. Fl. Bor.-Amer. **1:** 11. 1803.

P. australis Nutt. Jour. Acad. Nat. Sci. Philadelphia **7:** 103. 1834.
Isoloba pumila (Michx.) Raf. Fl. Tellur. **4:** 59. 1838.
P. floridensis Chapm. Fl. Southern U. S. ed. 1. 635. 1883.
P. pumila Michx. var. *Buswellii* Moldenke, Phytologia **1:** 98. 1934.

Distribution: Moist, sandy soil, generally in pinelands and savannas, from southeastern North Carolina, south to the Florida Keys and the Bahamas, and westward to central Louisiana and eastern Texas. Flowering November (tropical Fla.) to July (La.).

This diminutive species is by far the most variable of ours in respect to corolla color. Within a single colony may be found plants with either blue or white corolla lobes and with deeper blue or yellow tubes. (See *Godfrey 54483 & Kurz, Kral 4134 & Godfrey, Kral 4063* [fsu, gh].) Pink forms have been reported,

as well, while *Pinguicula pumila* var. *Buswellii,* from Collier County, Florida, is a form with entirely yellow flowers. Those individuals with blue corolla-lobes and yellow tube may be mistaken for small-flowered specimens of *P. primuliflora.* Under favorable conditions of moisture the rosettes of *P. pumila* may be more than twice the size of those usually collected. Plantlets, moreover, may proliferate from the leaves, a characteristic of frequent occurrence in both *P. primuliflora* and *P. planifolia* where likewise it is probably linked with abundant moisture.

4. **Pinguicula planifolia** Chapman, Fl. Southern U. S. ed. 3. 303. 1897.

Distribution: Pond margins, ditches, etc., usually submerged, in the region of the Apalachicola River of western Florida (within the area bounded by Leon, Franklin, Gulf, and Walton Counties), westward to coastal Miss. (Jackson Co.: Ocean Springs, F. S. Earle, 8 Mar. 1888 [FLAS]; 8 mi. ne. of Ocean Springs, *R. L. Diener 825*, 30 Mar. 1953 [MISSA]). Flowering March to April.

Pinguicula planifolia is a most distinctive species with its relatively narrow and deeply cleft corolla-lobes, short tube and very short, almost sac-like spur. (See fig. 8, 9.) The stamen-filaments and stigma are violet. Its leaves are similar to those of *P. primuliflora,* but are more elliptic in shape and are usually suffused with reddish-purple color whereas those of *P. primuliflora* are always bright green. This latter characteristic reflects in part, at least, the more exposed habitat of *P. planifolia* for, plants of this species grown under more shaded conditions are green. However, *P. planifolia* becomes purple under light intensities which produce no change in *P. primuliflora.* The almost druse-like hairs at the base of the palate of *P. planifolia* are highly characteristic. It may be noted that, although the plant is described as nearly glabrous (Chapman, Small), it is, as in all of the other species, covered with glandular hairs.

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NOTES ON THE GRASS FLORA OF THE CHICAGO REGION

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The Chicago region as designated by Swink (1953) includes all or parts of four counties in Illinois (Lake, Cook, Du Page and Will) and parts of three counties in Indiana (Lake, Porter and La Porte). For the past three years I have been studying and collecting grasses with the intention of preparing a grass flora of this region. During this period, many new records were discovered and are reported here along with notes on these and other pertinent grasses.

Specimens cited were examined by me at the following herbaria: Chicago Natural History Museum (F), University of Illinois, Navy Pier (NP), University of Illinois, Urbana (ILL), University of Wisconsin (WIS), and University of Indiana (IND). I want to thank the curators of these herbaria for the privilege of studying their specimens.

Agropyron repens L. forma aristatum (Schum.) Holmb. was reported from Lake County, Indiana by Steyermark and Swink (1952). After examining a large number of specimens from the Chicago region, I have concluded that *Agropyron repens* is an exceedingly variable species with no clear cut varieties or forms. In some specimens the lemmas are either all awnless or all awned, whereas in other specimens the lemmas are acute, awn tipped, short awned or long awned on the same plant. Furthermore, it is difficult to follow Fernald's (1950) key to the varieties and forms, especially in the distinction between "glumes abruptly narrowed" versus "glumes gradually tapering from middle." Fassett (1951) states that it is not unusual to find two forms of this species in a single collection and any large patch is apt to contain several forms.

Agropyron smithii Rydb. COOK: Palos Park, June 18, 1909, *Umbach*

3468 (WIS); West Englewood, June 20, 1918, *A. E. Johnson 3* (F). Previously reported from DuPage and Will Counties by Jones & Fuller (1955).

AGROSTIS PALUSTRIS Huds. COOK: Chicago, 92nd and Stony Island, August 10, 1956, *Glassman 3793* (NP); Oak Forest, July 3, 1914, *Hill 2/1914* (F). LAKE: Lake Villa, July 11, 1908, *Umbach 2290* (WIS). Previously reported from DuPage County by Jones & Fuller (1955). Fernald (1950) refers to this species as *Agrostis alba* var. *palustris* (Huds.) Pers. *A. palustris* has been frequently confused with *A. alba*, hence a key distinguishing the two follows:

Culms with leafy stolons and sometimes rhizomes in addition, densely matted; blades about 1–4 mm. wide, stiff; panicle branches closely appressed, closely contracted in fruit.... *A. palustris.*
Culms with rhizomes, not matted; blades 3–10 mm. wide, lax; panicle open, partially contracted in fruit........................ *A. alba.*

AGROSTIS PERENNANS var. AESTIVALIS Vasey. COOK: Riverside, Sept. 26, 1885, *Ohlendorf* (F). No previous records from the Chicago region. This variety is separated from the species by having smaller spikelets (1.5–1.8 mm. vs. 1.9–3.0 mm.) and by being smaller in size (less than 30 cm. vs. 30–100 cm.).

AGROSTIS SCABRA Willd. f. TUCKERMANI Fern. DU PAGE: Lisle, June 2, 1896, *Umbach 3300* (WIS). Not previously reported from the Chicago region. In this form the lemmas are dorsally awned.

ALOPECURUS PRATENSIS L. LAKE: Lake Forest, May, 1895, *M. L. Jensen 89* (F); COOK: Chicago, Graceland, June, 1905, *Gates 478* (F). Not previously reported for the Chicago region. This species differs from others in the region by the longer spikelets (3.5–5 mm. vs. 2–3 mm.) and longer anthers (2.5–3.0 mm. vs. 0.5 mm.).

ARISTIDA INTERMEDIA Scribn. & Ball. LAKE: Waukegan, June, and Sept. 4, 1909, *Gates 3260* and *Gates* (no number) (both ILL); PORTER: Beverly Shores, Aug. 28, and Sept. 5, 1956, *Glassman 3846* and *3899* (both NP). Not listed from Chicago region by Jones & Fuller (1955). Not listed by Deam (1940) for Porter County; however, cited by Pepoon (1927) for that county, but probably based on a misidentified specimen of *A. purpurascens* (see Fassett (1933)).

ARISTIDA LONGESPICA Poir. PORTER: Tremont, Oct. 9, 1955, *H. R. Bennett* (NP). First verifiable record for Porter County. Reported by Peattie (1930), but no specimens have been seen.

ARISTIDA PURPURASCENS Poir. DU PAGE: Wheaton, 1895, *Moffatt 3335* (WIS). Not previously reported from Du Page County.

BROMUS INERMIS Leyss. LAKE (Indiana): Hammond, June 24, 1933, *Deam 53918* (IND.). PORTER: Beverly Shores, Sept. 1, 1956, *Glassman 3888* (NP). Previous reports from the Indiana part of the Chicago region are by Peattie (1930), without a cited specimen, and by Deam et al. (1947) from La Porte County.

BROMUS JAPONICUS Thunb. PORTER: Beverly Shores, Sept. 1, 1956, *Glassman 3891* (NP). Also reported from La Porte County by Deam et al. (1947).

Bromus latiglumis (Shear) Hitchc. f. incanus (Shear) Fern. cook: Riverside, Aug. 14, 1884, *Ohlendorf* (f). Not previously reported from the Illinois part of the Chicago region. According to Wagnon (1950), the valid name for *B. latiglumis* (Shear) Hitch. is actually *Bromus purgans* L. Until I can personally look into the matter further, I prefer retaining the name *B. latiglumis*.

Bromus nottawayanus Fern. cook: Riverside, July 27, 1884, *Ohlendorf* (f). Wagnon (1952) lists this for the Sand Dune area of Indiana, but apparently, this is the first record for the Illinois portion of the Chicago region. This species is distinguished from *B. ciliatus*, *B. purgans*, and *B. latiglumis* by the distinctly five-nerved second glume. The status of this species is still doubtful since there are so few collections of it. Wagnon (1952) thinks that *B. nottowayanus* is probably a hybrid between *B. purgans* and *B. latiglumis*.

Bromus purgans L. du page: Warrenville, June 15, 1895, *Umbach 3355* (wis). First record for Du Page County. According to Wagnon (1950), the valid name for this species is *B. pubescens*, however, I am not using this designation until I investigate the matter further.

Bromus sterilis L. cook: Ravenswood, Chicago, June 12, 1905, *Gates 447* (f). First report for the Chicago region. Jones & Fuller (1955) listed a similar species, *B. rigidus* Roth, collected in Chicago by Gates in 1905. Mosher (1918) and Pepoon (1927) cited the same specimen under *B. villosus* Forsk. As I have not seen this specimen, I cannot be certain whether it is *B. rigidus* or *B. sterilis*. The two species are separated as follows:

Spikelets 2.5–3.0 cm.; first glume .8–1.0 cm., second glume 1.3–1.5 cm.; lemmas 1.5–2.0 cm., awns 2.0–3.0 cm. . . . . *B. sterilis.*
Spikelets 3.0–4.0 cm.; first glume 1.5–2.0 cm., second glume 2.5–3.0 cm.; lemmas 2.5–3.0 cm., awns 3.5–5.0 cm. . . . . *B. rigidus.*

Eleusine indica L. la porte: Michigan City, Aug. 27, 1956, *Glassman 3827* (np). First record for the Indiana part of the Chicago region.

Elymus villosus Muhl. f. arkansanus (Scribn. & Ball) Fern. du page: Downers Grove, *Umbach 11064*, July 14, 1900 (wis). Not previously reported from the Chicago region. The form differs from the species in having lemmas glabrate to puberulent on lower part of body and glabrate to short hispid on the upper part vs. lemmas glabrate to hispid on lower part and hispid to villous on upper part.

Eragrostis frankii C. A. Meyer. porter: Dunes State Park, Sept. 25, 1955, *H. R. Bennett* (np); Beverly Shores, Aug. 31, 1956, *Glassman 3886* (np). First record for Porter County. Deam (1929) states that Pepoon (1927) published a record of this species for Porter County, but he actually mentioned the plant for Cook County only.

Eragrostis poaeoides Beauv. porter: Beverly Shores, Aug. 28, 1956, *Glassman 3837* (np). First report for the Indiana part of the Chicago region. Since this species is frequently confused with *E. cilianensis* (All.) Link, a key separating the two is given below:

Mature spikelets 1–2 mm. wide, 5–9 mm. long; glands of lemmas and glumes mostly obscure . . . . *E. poaeoides.*
Mature spikelets 2.5–3 mm. wide, 5–15 mm. long, glands of lemmas and glumes prominent . . . . *E. cilianensis.*

Festuca elatior L. porter: Porter, Aug. 16, 1920, *Peattie 214* (f). Not previously reported for Porter County.

Festuca obtusa Bieler. lake: Beach Station, July 3, 1909, *Umbach 3752* and *3753* (wis). First record for Lake County.

Hystrix patula Moench. var. bigeloviana (Fern.) Deam. lake (Illinois): Lake Forest, 1895, *M. L. Jensen 87* (f). cook: Beverly Hills, June 22, 1902, *R. Bebb 902* (f). du page: Maple Grove Forest Preserve near Downers Grove, June 18, 1953, *Swink 2200* (f). Not previously reported from the Illinois part of the Chicago region.

Leptoloma cognatum (Schultes) Chase. cook: Chicago, near 49th and Lake Shore Drive, along Illinois Central RR., Aug. 11, 1956, *Glassman 3802* (np); Chicago, between 14th and 31st Sts., Illinois Central RR. yards, Aug. 7, 1956, *Thieret 2184* (f). Not previously reported for the Illinois portion of the Chicago region.

Muhlenbergia frondosa (Poir.) Fern. f. commutata (Scribn.) Fern. du page: Glen Ellyn, Sept. 2, 1917, *Benke 1967* (f); Wheaton, Sept. 8, 1892, *Moffatt 3459* (wis). First report for the Chicago region of Illinois. Differs from the species in the awned lemmas.

Muhlenbergia glomerata (Willd.) Trin. cook: West side of Wolf Lake, Oct. 17, 1953, *H. R. Bennett* (f); Chicago Ridge, Aug. 12, 1951, *Swink 309* (f). First records for Cook County.

Panicum meridionale Ashe. will: Two miles southeast of Custer Park, Aug. 24, 1947, *Steyermark 64862* (f). Not previously reported from Will County. This species has frequently been confused with *P. implicatum* Scribn. (sensu stricto), thus a key distinguishing the two follows:

Many of the culms and sheaths covered with a mixture of pilose and puberulent hairs; upper blade surfaces entirely covered with long pilose hairs . . . . *P. meridionale.*
Culms and sheaths covered with either long pilose or short pilose hairs only; upper blade surfaces with long pilose hairs at base and margins, glabrous or medium to short pilose otherwise . . . . *P. implicatum.*

Paspalum ciliatifolium Michx. var. stramineum (Nash) Fernald. porter: Beverly Shores, Aug. 19, 1956, *Glassman 3803* (np). Otherwise known from Miller and Liverpool (Lake County, Ind.) and Michigan City (La Porte County) in the Chicago region. Also called *P. stramineum* Nash by Deam (1940) and other authors.

Poa trivialis L. lake (Indiana): Highland, Aug. 15, 1925, *Peattie 1999* (f). First verifiable record for the Indiana part of the Chicago region. Peattie (1932) listed it for Clarke, Lake County, but I have not seen this particular specimen. In the literature, e. g. Fernald (1950),

Chase (1951) and Pohl (1954), there seems to be some confusion and contradiction in distinguishing among *P. trivialis*, *P. palustris* L., *P. alsodes* Gray, and *P. languida* Hitchc. The following key attempts to separate these species:

Keel and marginal nerves of lemmas distinctly pubescent at least on lower half; panicle 10–30 cm. long .... *P. palustris.*
Marginal nerves of lemmas glabrous or slightly pubescent on lower third; panicle 5–10 cm. long.
Lemmas very blunt, glabrous on keel; panicle branches in twos or threes .... *P. languida.*
Lemmas acute at tip, pubescent on keel; panicle branches in fours or fives.
Spikelets 2.5–4.5 mm. long, crowded and subsessile or on short pedicels; second glume with prominent lateral nerves .... *P. trivialis.*
Spikelets 4–6 mm. long, loosely arranged on the panicle; second glume with obscure lateral nerves .... *P. alsodes.*

Setaria verticillata (L) Beauv. lake (Illinois): Waukegan, July 29, 1912, *Umbach 5849* (wis). Not previously recorded from Lake County. Pepoon (1927) reported this species from Naperville, Du Page County, collected by Umbach, but the specimen cited is actually *S. lutescens* (Weigel) Hubb. (*S. glauca* (L.) Beauv.).

Setaria viridis × faberi ? cook: Chicago, Chapell and 68th streets, Sept. 26, 1941, *Standley* (f); Chicago, 53rd and Lake Shore Dr., Aug. 20, 1956, *Glassman 3815* (np). *S. viridis* (L.) Beauv. is separated from *S. faberi* Herrm. by having spikelets 1.8–2.5 mm. long and glabrous blades vs. spikelets 2.6–3.0 mm. long and softly pubescent to glabrescent blades. Both specimens cited above have glabrous blades, but the *Standley* specimen has spikelets 2.5–2.8 mm. long and *Glassman 3815* has spikelets 2.8–3.0 mm. long. It is therefore supposed that these plants may be hybrids between *S. viridis* and *S. faberi*.

Sorghum halepense (L.) Pers. cook: Chicago, Brighton Park, Sept. 5, 1896, *Umbach 3539* (wis). Another specimen listed for Cook County (East of Glencoe, June 22, 1907, *Gates 1686.1* (f)) by Pepoon (1927) is actually *Arrhenatherum elatius* (L.) Mert. & Koch f.; Mosher (1918) also cites the same specimen under *Holcus halepensis* L.

Sporobolus asper (Michx.) Kunth. lake (Indiana): Hobart, Sept. 19, 1936, *Benke 5797* (f). First verifiable record for the Chicago region of Indiana. Pepoon (1927) lists this species from Tremont, Porter County, but I have not seen a specimen from there.

Triodia flava (L.) Smyth f. cuprea (Jacq.) Fosberg. porter: Beverly Shores, Sept. 5, 1956, *Glassman 3902* (np); east boundary of Dune State Park, N. side of Rt. 12, Sept. 3, 1955, *Thieret 1643* (np). cook: Chicago, University Ave. near 53rd St., vacant lot, Sept. 30, 1956, *Glassman 3933* (np). First records for the Indiana part of Chicago region, and the second report for Cook County, the other being from Thornton by Steyermark and Swink (1955).

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A MODEST PLEA IN FAVOR OF DIVERS TAXONS.—Dr. Lam's coining of the term taxon is another demonstration that necessity is the mother of invention. The sudden popularity of the word, with an acquired double meaning, perhaps illustrates the equally true converse, that invention is the mother of necessity. Having acquired a felicitous term to use in one area, we suddenly discover how badly we needed just such a term in a closely parallel one. There is nothing wrong with using the same term in both. The English word "man" signifies something concrete and individual, something concrete but generalized, and, further, something abstract and generalized. No difficulty arises from all this. If we were to carry over the idea of strictly segregated terms, we should not be allowed to say "man is a warm-blooded

animal." We should have to say carefully, "mankind is a warm-blooded animal." Or perhaps we should have to coin a third intermediate term to make this statement, and reserve the existing compound one to use when speaking of the spirit or the progress of mankind. This would be quite needlessly pedantic. Actual usage is far more decisive than formal definitions. "Taxon" is here to stay for concrete as well as abstract uses, regardless of the narrow meaning originally intended, and both uses are legitimate. But Morton is justified in saying that the "unlimited extension of the meaning is not only ridiculous, it is worse, not precise" (Rhodora **59:** 43, 1957). Certainly if one is talking about species, one ought to say species, in preference to the indefinite term taxon. There are times, however, when the latter collective term is preferable. Surely it is better to shorten "species, varieties, and forms of *Panicum*, for example, to "taxa of (or within) *Panicum*." This involves literary taste and judgment, which cannot be subjected to precise rules. Scientists—especially in present-day America—are not notable for their talents in the way of literary expression, and unfortunately we shall have to endure another over-worked cliché, ranking with "the literature," "workers," and "the authors." If Morton's protest puts a stop to the excessive use of "taxon" on every possible occasion (and some impossible ones), without discernment or feeling for appropriateness and precision, he will have accomplished a miracle. But however scanty any optimism about the results, it is good to know that at least one American botanist has sufficient awareness and concern to express himself in print. "The literature" (grotesque phrase) grows constantly more stereotyped, more "acceptable," and more zombie-like.

The plural of taxon is another matter of literary taste. The officially prescribed plural, taxa, is of course correct for Latin or Greek. But in English, taxons is to me a more natural form. I prefer it, just as I prefer indexes to indices. Neither form is either more or less correct than the other. The word museum is so thoroughly naturalized that almost never does any plural except museums occur in common usage. Herbarium is a less well-established word, and rather inconsistently, the usual plural is herbaria. At times I prefer herbariums, but feel no need to be consistent about it. The excessive popu-

larity of "taxa" perhaps is symptomatic of two things: the appalling modern American eagerness to conform, and the chance to feel oneself a classical scholar of sorts without having to put forth any effort. Probably the most extreme example of an attempt to create the appearance of scholarship without any learning is the International Code of Zoological Nomenclature, the major portion of which now consists of "push-button" instructions (often contradictory, frequently incorrect, rarely indicative of literary taste or understanding) about Latin and Greek names, for those ignorant of classical languages and, one must assume, obstinate about not trying to learn. The practical unworkability of the multitude of instructions has long been painfully evident in zoological publications. It is obvious to anyone who tries to read through them, but apparently hardly anyone really does. It is a pity that botanists are not better acquainted with the Zoological Code; they would appreciate the great superiority of their own. Some of the worst features of the zoological one are persistently offered for incorporation in the botanical. Among these are proposals to lay down rigid regulations about the handling of Greek and Latin, of which the prescribed plural "taxa" is a minor example. It is neither necessary nor at all desirable to lay down a botanical (or zoological) law for all the minutiae. One cannot escape the fact that a certain amount of literary taste will always be involved. Experience has already shown the impossibility of strict regimentation.

So:—long live taxons, whatever the kind!—LLOYD H. SHINNERS, SOUTHERN METHODIST UNIVERSITY, DALLAS 5, TEXAS.

DRABA LANCEOLATA IN THE OTTAWA DISTRICT.[1] On May 23, 1947, three immature specimens of an unknown species of *Draba* were collected on the face of the Pre-Cambrian escarpment about ten miles northwest of the city of Ottawa. Up until this time only the easily recognized *Draba nemorosa* L. had been known in the vicinity of Ottawa. This, then, was a species new to the district, but final identification of the immature specimens was not possible.

It was not until July 6, 1956, that an opportunity arose to

[1] Contribution No. 1582 from the Botany and Plant Pathology Division, Science Service, Canada Department of Agriculture Ottawa, Ontario.

revisit the site. This time a sufficient number of mature plants to make several herbarium sheets were obtained. The densely stellate-pannose pubescence on the valves of the mature fruit served to help identify the species as *Draba lanceolata* Royle.

Data are as follows: QUEBEC, Gatineau County, Hull Township, conc. 8, lot 26, high on cliff face of south facing escarpment just west of King Mountain, *Dore, Cody & Breitung 47–35* (DAO); same locality, very rare in moist crevices and in dry moss patches on open faces of Pre-Cambrian rock, ca. 600 feet altitude, *Cody & van Rens 9379* (DAO). Duplicates of the latter collection will be sent to Montreal Botanic Garden, Gray Herbarium and Natural History Museum, Stockholm.

Fernald[2] gives the range of *D. lanceolata* as "Northern and alpine regions of Asia and North America; in America from eastern Quebec to Yukon, locally south to New Brunswick, northern New Hampshire, northern Vermont, Ontario, Michigan, Wisconsin, Colorado and Utah." The eastern American specimens seen by him are cited and a map showing their distribution is given. The southern Canadian localities given are Nashwaak in New Brunswick, Mt. St. Pierre, Bic and St. Fabien in the Gaspé area of Quebec, and Lion's Head and Dyer's Bay in Bruce Peninsula, Ontario.

Marie-Victorin[3] states that this plant is relict in his area (southern Quebec). It is certainly very rare in the Ottawa District since it has not been located elsewhere in the vicinity in over seventy-five years of botanical collecting, and its occurrence similarly appears to be relict. The site where it occurs is at an elevation of about 600 feet, some 400 feet above the plain the Ottawa River half a mile away. This is just below the presumed maximum level of the Champlain Sea in this area. It would thus appear that *D. lanceolata* reached the locality reported here via cliffs bordering the Champlain Sea. The retreat of that sea and the subsequent invasion of many more aggressive species has restricted *D. lanceolata*, which apparently cannot compete with them, to the open, almost inaccessible faces of the Pre-Cambrian escarpment. Similar habitats along this old shoreline might reveal other, as yet unrecorded, stations for this interesting plant which, in the southern part of its range, appears to be

[2] Fernald, M. L. Draba in temperate northeastern America. RHODORA **36**: 358. 1934.

[3] Marie-Victorin, Frère, Flore Laurentienne. Imprimerie de la Salle, Montreal. 1935.

almost completely confined to cliffs and rocky faces which border present-day and ancient large bodies of water.

Draba lanceolata can now be added to the floras of the Ottawa District and of western Quebec.—W. J. Cody.

Alternanthera in Virginia.—*Alternanthera* (*Amaranthaceae*) is a tropical genus of more than 150 species. Two or three species occur in southeastern United States. One of these, *A. philoxeroides*, Griseb. (*Achyranthes p.*, (Mart.) Standley), is an aggressive weed in moist to wet soil and waterways along the Atlantic and Gulf coasts, especially in Louisiana and Mississippi. It has been introduced along some of the TVA Lakes in Tennessee. The genus is not listed in Gray's Manual, 8th Ed. It was first recorded in the manual range in southeastern Virginia in 1953 as a lawn pest in Hampton, Virginia. It has since been found in Princess Anne and Isle of Wight counties, Virginia. In Princess Anne County it is a pest in an asparagus field. It is believed to have been brought from eastern Carolina with asparagus plants. How or when it was introduced into Isle of Wight County and Hampton is not known. It is well established in both places, especially in southern Isle of Wight County where it has become distributed over a field of several acres. It is commonly known as alligator weed or by some people as alligator grass. It develops short jointed rhizomes very freely. When broken or cut into pieces each joint can develop a plant. Consequently it is difficult to eradicate. Weed killers have been used with varying success. Its control is discussed by Martin, A. C., in Improving Duck Marshes by Weed Control, Cir. 19, Fish and Wildlife Service, U. S. Dept. of Interior. Specimens have been placed in the Gray Herbarium—A. B. Massey, virginia polytechnic institute.

New Plant Station Records in Missouri.—During the past several years new locations have been noted for several species in Missouri. One species is apparently new to the State. The others, in locations to be described, hitherto have been overlooked or are currently expanding their range. The several species with collection data are as follows:

Pteridium aquilinum (L.) Kuhn var. latiusculum (Desv.) Underw. This fern, which occurs in the Ozarks, was previously unknown from Boone County in Central Missouri. Specimens were collected in open ground bordering steam, T50N, R13W, sect. 11, SW¼ in Boone County, July 20, 1955., (2455).

Phragmites communis Trin. var. Berlandieri (Fourn.) Fern. Spreading colonies were found on alluvial deposition bordering the Missouri River. This station, from which a collection was made, lies south and east of previously reported localities in the state, T47N, R14W, sect. 4, NW¼, Moniteau County, December 28, 1955., (2530).

Hexalectris spicata (Walt.) Barnh. Scattered plants were found in Boone County by Professor D. S. Van Fleet. Previously known in Missouri only from the Ozarks, this species is reported for the first time north of the Missouri River. Flowering specimens were growing in heavy woods on well-drained, loessial slopes, T48N, R14W, sect. 7, SW¼, August 11, 1955., (2471).

Medicago arabica (L.) Huds. Previously unreported for Missouri, this adventive was observed in open ground and roadways 1½ miles south of Sikeston, T25N, R14E, sect. 6, New Madrid Co. Locally abundant and apparently established, fruiting specimens of this species were collected by Dan Neely, May 10, 1955.

Helenium tenuifolium Nutt. This species, common to various parts of the Ozarks, was previously unknown from Boone County. It has been observed spreading to waste ground and roadsides. Specimens were collected from pasture, T49N, R13W, sect. 12, September 5, 1955., (2514).

Specimens have been prepared for deposit in the University of Missouri Herbarium.—C. L. Kucera, department of botany, university missouri, columbia.

Chromosome Numbers in the Higher Plants.—A few months ago, while browsing through the book reviews in the last issue of the "Quarterly Review of Biology," my eye was caught by the statement that ". . . one half of all the ferns and flowering plants are of polyploid origin. . . ."[1] That statement seemed to me to be unscientific; unscientific, because I did not believe that available data would substantiate the quantitative part of the assertion; unscientific, because we do not have the historical knowledge of plant genera and species which the word "origin" implies.

This statement did prompt me to turn my attention to the "Chromosome Atlas of Flowering Plants"[2] by Darlington and Wylie, which purports to (and probably does) summarize our knowledge of chromosome number in the gymnosperms and angiosperms. This book supplies the raw data on which statements about relative abundance of chromosome numbers in these two groups may be based. Though it is only a compilation—and subject to all the faults that pertain thereto—it fills a definite need. It deserves the attention of systematists, taxonomists—and geneticists. In order to see what the facts bearing on the preliminary statement might be, I sat down with the "Atlas . . . ," an adding machine, and a few books of reference. The following figures were the result.

According to the best estimate available,[3] there are, in the world today, about 250,700 species of angiosperms and gymnosperms. Of these, about 720 are gymnosperms, 200,000 are dicotyledons, and 50,000 are monocotyledons. Darlington and Wylie record that in these three groups representatives of some 15,000 species have been analyzed. This constitutes about 6% of the total number of species known. A count of the data given shows that about 5,000 species, or ⅓ of the total number analyzed, give evidence of a polyploid chromosome number. Thus, to date, about 2% of the total number of species of higher plants have been proved to have polyploid representatives. This can hardly be construed as ". . . one half. . . ."

On using the "Chromosome Atlas of Flowering Plants," one is impressed by a number of rather significant tendencies. Perhaps the most striking is the large number of chromosome counts which appear to be based on but a single report—or, alternatively, the number of species with a stable chromosome number. By my count, only about 1,700 taxa, or 11% of the number analyzed, are recorded with two or more different chromosome numbers. A second bias is the geographical limitation of origin of these reports, the vast majority from western Europe, temperate North America, India and Japan.

One is impressed, also, by the large number of species of economic importance which have been reported on. The taxonomist will remember

[1] Quart. Rev. Biol. 31 (2); 133, June, 1956.

[2] Darlington, C. D. and Wylie, A. P.—Chromosome Atlas of Flowering Plants—London, Allen and Unwin, Ltd. 1955. pp. 519.

[3] Jones, G. N. on the number of Species of Plants. Scientific Monthly, 72 (5): 289–295. May, 1951.

that plants in cultivation are not necessarily characteristic of the wild populations, morphologically or cytologically, and that identifications of cultivated material—including plants in botanic gardens—are not infrequently of dubious validity. Likewise, a significant proportion of the species appears to be native in temperate regions. It will be remembered that such plants are, at least occasionally, exposed to conditions of, for them, extreme cold. It will be remembered that this is one of the conditions which have been known to induce cytological abnormalities.

One is impressed by the paucity of reports on tropical plants. This, despite the fact that speciation is probably more fully developed in the tropical rainforest than in the temperate zone. For instance, the *Orchidaceae*, a predominantly tropical family, is well known for extreme variation of floral morphology. It is a family estimated to contain more than 15,000 species—more than the number of species that is recorded in the "Atlas" for all of the higher plants. However, apparently only about 195 species (or 1.3%) of the orchids have been studied cytologically. Of three orchidaceous genera, any one of which contains more than one thousand species, counts are recorded for only eight species of *Dendrobium*. Six species of *Epidendrum*, and no species of *Bulbophyllym*.

The orchids are not alone in not having been studied. The *Convolvulaceae*, with an estimated 1,650 species in 55 genera,[4] are represented in the "Atlas" by 51 species (3%), in 14 genera of which about 16 appear to be polyploids. The genus *Ipomoea*, estimated to contain about 500 species,[4] is represented by only 11 species (2%), of which possibly four species are polyploids. The *Palmae*, with a world census of about 1500 species in 200 genera,[5] is represented in the "Atlas" by about 78 species (5%) in 50 genera. No polyploids seem to have been recorded. The *Proteaceae*, with about 1300 species in 60 genera,[4] are represented by 36 (3%) species in 24 genera. There appear to be about 11 polyploids recorded. The *Flacourtiaceae*, likewise with about 1300 species in 84 genera,[4] are adumbrated to the extent of 6 species (.5%) two of which are polyploids in three genera. The *Dioscoreaceae*, with 600 species in 9 genera, are represented by some 20 species (3%) with 14 polyploids in 3 genera.

This is not to imply, however, that plants of the temperate zones have been exhaustively studied. The *Compositae*, for instance, which include some 13,000 species in 900 genera,[5] have been studied to date to the extent of 852 species (7%) in 199 genera. There appear to be some 300 polyploids. The genus *Senecio*, with an estimated 2,000 species,[5] is represented by counts of 38 species, (2%) 36 of which seem to be polyploids. It would seem incautious, however, to assume that 94% of the genus is polyploid on the basis of such a scanty sample. The *Umbelliferae*, an admittedly intricate family taxonomically, are reputed to include about 2,700 species in 200 genera.[5] To date we have counts for 187 (7%) species in 79 genera. Twenty-four polyploids have been reported.

[4] Flora Malesiana, Series I, vols. 4 and 5.

[5] Willis, J. C. Dictionary of the Flowering Plants and Ferns, Ed. 6. Cambridge (repr. 1948).

The *Gramineae* is said to include about 4500 species in 450 genera. Of this number, some 1350 species (30%) in 255 genera have been analyzed. Somewhat over 900 of the species seem to be polyploids. This is a proportion significantly higher than the average for the rest of the higher plants. Indeed, comparisons may be made only with genera such as *Sedum* or *Salix*. It would seem that conclusions based on this apparent divergence from the normal should await the accumulation of considerably more data than are available at present.

The *Leguminosae* is a particularly instructive family from the viewpoint of chromosome numbers. In the sixth edition of Willis's "Dictionary of the Flowering Plants and Ferns" the family was credited with about 600 genera. Recent estimates of the number of genera, published in the "Flore du Congo-belge" approximate the figures given by Willis.

The legumes are customarily divided into three sub-families or families. Two of the groups (*Mimosoideae* and *Caesalpinioideae*) which account for about 200 genera and 2500 species are predominantly tropical. The third group (*Papilionatae*) accounts for the balance—some 400–425 genera and about 10,000 species. It is predominantly temperate or warm-temperate in distribution.

Taking the *Mimosoideae* and *Caesalpinioideae* together, the "Atlas" accounts for 47 genera (about 23%) and 204 species (about 13%). My count gives 52 polyploids, or about 25% of the species analyzed. This would seem a far cry from the alleged one half.

We turn now to the sub-family *Papilionatae,* which comprises an estimated 400 genera and 10,000 species. It is predominantly temperate and warm-temperate in distribution. It includes at least 15 genera with more than 100 species. The largest genus, *Astragalus,* has about 1600 species. Many of the species of the sub-family have an economic importance. If cytological analysis had progressed to any great length, one would be inclined to think that this sub-family should give an excellent test of the correlation of polyploidy with speciation. Study of the "Atlas" reveals the following:

TRIFOLIUM is a genus of about 290 species. The "Atlas" records counts for about 40 species, with 8 polyploids. With two exceptions, all of the species are reputed to be used for forage. 28 of the species are listed as European in distribution. In the area covered by Hegi, about 200 species are recorded. 6 of the reported species are reputed to be native in western North America. Abrams accounts for 54 species in part of the same area.

LUPINUS is a genus of about 150 species. The "Atlas" records counts for 22 species, of which nearly all are polyploids. Five species are attributed to Europe. Hegi lists 28. Nine are referred to the west coast of this country. Abrams records 84. One might note in passing that the common *Lupinus perennis,* widespread in the eastern United States is not recorded.

DESMODIUM is a genus of about 170 species, strongly developed in the tropics and sub-tropics. Counts for 11 species are recorded in the "Atlas." Five of the species fall within the "Grays Manual" range. Schubert, in Fernald, accounts for 24 species. No polyploids have been recorded.

ASTRAGALUS, as noted above, is a genus of about 1600 species. The "Atlas" records 5 species, one of them a polyploid, from western North America.

Abrams records 140 species. Five species in the "Atlas" are attributed to the "Grays Manual" range. Fernald records 25 from the same area. Nine or ten species are referred to Europe. Hegi records about 100 species. Fourteen species are supposed to be Asiatic. The Flora URSS records 849. "The Flora of British India" records 70 species. Altogether the "Atlas" records 35 species.

We must thank Drs. Darlington and Wylie for this compilation, for it shows us very clearly how little we know about chromosome numbers in plants. The "Chromosome Atlas of Flowering Plants" is a valuable statement of progress—but we must not misconstrue it as a final report. I fear that the vast majority of the figures reported here are based upon samples that are statistically meaningless. They can, indeed, be taken only as a very general indication of what we might expect to find should we chose to investigate more fully. In no sense may these reports be treated as though they were axioms of Euclidian geometry. We need to know a great deal more about populations, and about species, and about genera before we use these facts, or any related facts, in any large scheme of speculation. We can neither affirm nor deny that . . . "half of all the ferns and flowering plants are of polyploid origin." We can only say that present evidence does not lend much credence to this assertion.—Gordon P. DeWolf, Jr.

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NOTES ON ORCHIDS FROM LA BAYAMESA, CUBA

John H. Beaman[1] and Richard Evans Schultes[2]

In July, 1955, the members of Harvard University's course in Tropical Botany (Biology 215) carried out plant collecting activities in several parts of Cuba. A number of the collections are of interest as representing new stations for a genus or species or as the second or third time a rare species has turned up on the Island. This appears to be especially true of the orchids gathered on the Pico de La Bayamesa. The following notes on the orchids from this second highest peak in Cuba are offered because of the rarity or phytogeographical interest of a number of the finds.

The course comprised four graduate students at Harvard University: Mr. Arthur S. Barclay, Mr. John H. Beaman, Mr. Jack A. Freeberg and Mr. Tchang-Bok Lee; and the instructor, Dr. Richard Evans Schultes. Studies of the forests at or near the summit of La Bayamesa, between 4900 and 5200 feet, were carried on between July 16 and 19, 1955. Intensive logging operations were in progress at this time, and it was possible to reach the top of the mountain by truck. We wish to acknowledge our gratitude to Señor Antonio Moreno, administrator of the operations, for his friendly help which enabled us to visit the area and to spend four very productive days at the summit of the mountain.

Relatively little botanical collecting has been carried out in the Sierra Maestra, that east-west ridge skirting the southwestern

[1] Assistant Professor, Michigan State University.

[2] Curator, Orchid Herbarium of Oakes Ames, Botanical Museum, Harvard University.

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coast of the Cuban Provincia del Oriente. Pico Turquino, the highest mountain of Cuba, rising to over 6,000 feet and Pico de La Bayamesa, the second highest, lie relatively close together. Several collecting trips have gathered material from Turquino and from the valleys between Turquino and La Bayamesa. The following notes constitute apparently the first published records of orchids from La Bayamesa.

Most of the orchids enumerated below have been determined by the writers at the Orchid Herbarium of Oakes Ames of the Botanical Museum of Harvard University. The collections of *Lepanthes*, *Pleurothallis* and *Stelis*, have been identified by Mr. Leslie A. Garay, Assistant Curator of the Herbarium of the University of Toronto in Canada. Specimens of each collection cited have been deposited in the Ames Herbarium.

Reference to the distribution of species is based on a study of the material in the Ames Herbarium and on reports in the two modern treatments of Cuban orchids: Julian Acuña, "Catálogo descriptivo de las orquídeas cubanas" Estac. Exper. Agron. Santiago de Las Vegas Bol. No. 60 (1939) [June, 1938]; Hermano León, "Flora de Cuba," Vol. 1, Contrib. Ocas. Mus. Hist. Nac. Col. La Salle No. 8 (1946).

The data on the labels of the collections cited below are the same for each number and are as follows:

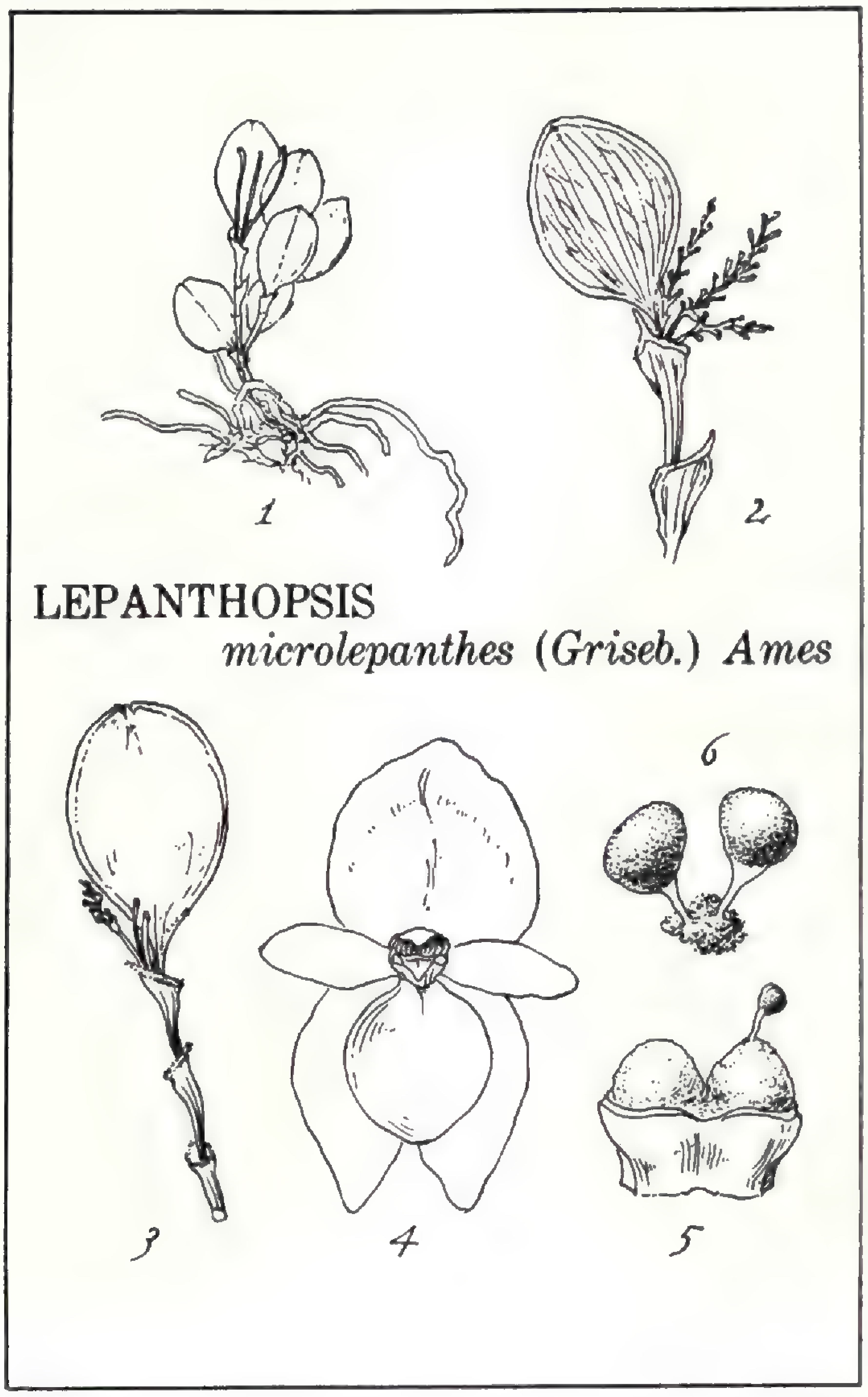
Cuba: *Province of Oriente*, Sierra Maestra, Pico de La Bayamesa. North slope. Altitude 4900–5200 feet. July 16–19, 1955. Coll. *Harvard Course in Tropical Botany No. 000* (R. E. Schultes, A. S. Barclay, J. H. Beaman, J. A. Freeberg, T-B. Lee).

Each collection is cited in the text only by its collection number and the number of the specimen in the Ames Herbarium. For convenience, the genera are listed alphabetically and not in phylogenetic order.

Calanthe mexicana Reichenb. f. No. 597 (Hb. Ames 68351; 68354).

This terrestrial orchid, known from Jamaica, southern Mexico, Guatemala, Costa Rica and Panama, is rare in Cuba, having been found only in the Provincia del Oriente. Acuña cites it from Mt. Líbano but indicates that he saw no material from Cuba. That it is rare on the island is shown by the fact that the collection cited above is the first material from Cuba in the Ames Herbarium.

Correll (in Lloydia 10 (1947) 214) has separated the Antillean material of *Calanthe* as a variety: *C. mexicana* var. *lanceolata*. This variety is known from Jamaica, Haiti and the Dominican Republic. Our material



Lepanthopsis microlepanthes (Griseb.) Ames. Drawn by B. Ames.

from eastern Cuba, however, does not seem to diverge enough from the variable *Calanthe mexicana* to include it in this rather poorly defined variety.

Dichaea glauca (Sw.) Lindl. No. 603 (Hb. Ames 68364).

Dichaea glauca, distributed through Jamaica, Hispaniola, Mexico and Guatemala, occurs in Cuba apparently only in the eastern regions where it has been collected previously on Sierra Maestra, Gran Piedra, Loma del Gato and Punta de Palmamocha.

Dichaea trichocarpa (Sw.) Lindl. No. 687 (Hb. Ames 68232); No. 796 (Hb. Ames 68349).

Known also from Jamaica and Hispaniola, *Dichaea trichocarpa* occurs in Cuba only in the Provincia del Oriente, where it has been cited by Acuña from Pico Turquino and Loma del Gato.

Epidendrum cochleatum L. No. 609 (Hb. Ames 68361).

The widespread tropical *Epidendrum cochleatum* occurs throughout Cuba.

Epidendrum crassilabium Poepp. & Endl. No. 607 (Hb. Ames 68236; 68237); No. 760 (Hb. Ames 68348; 68355).

Widespread in tropical America, *Epidendrum crassilabium* has been reported from Cuba only from the Provincia del Oriente. In the Ames Herbarium, there is material from Loma del Gato. Acuña (under *Auliza Wilsoni* Acuña) cites it from Pico Turquino, Sierra de Moa and Sierra Maestra.

The collection *760* is unusually small vegetatively, but this may be due to excessive sunlight. The plant was growing on fallen trunks in a clearing made by logging operations.

Epidendrum repens Cogn. No. 601 (Hb. Ames 68362).

Known from the Antilles, Mexico, Guatemala and northern South America, *Epidendrum repens* is apparently confined in Cuba to the Provincia del Oriente, where it has been reported from Sierra Maestra between Pico Turquino and Bayamesa.

Fuertesiella pterichoides Schltr. *Cranichis grandiflora* Ames & Schweinf. *Fuertesiella grandiflora* (A. & S.) Schltr. No. 598 (Hb. Ames 68238; 68239); No. 772 (Hb. Ames 68240).

Two species have been included in this genus which has been split from *Cranichis* on rather minor characters: *F. pterichoides* from Santo Domingo and *F. grandiflora* (A. & S.) Schltr. from the Provincia del Oriente in Cuba. Schweinfurth later considered the latter to be synonymous with the former (Bot. Mus. Leafl. Harvard Univ. 11 (1944) 173). An examination of the ample material in the collections cited above would support this disposition of the concept *Fuertesiella grandiflora*.

Fuertesiella grandiflora in Cuba is known from Loma de San Juan, Sierra Maestra and Pico de La Bayamesa.

Isochilus linearis (Jacq.) R. Br. No. 699 (Hb. Ames 68235).

Widespread throughout tropical America, *Isochilus linearis* has been collected in Cuba in the mountainous parts of Santa Clara, Las Villas and Oriente. It is especially common in the Provincia del Oriente.

Lepanthes Ekmanii Schltr. No. 792 (Hb. Ames 68583).

Lepanthes Ekmanii has previously been reported from Pico Turquino.

Lepanthes Lindmaniana Schltr. No. 611 (Hb. Ames 68581).

Lepanthes Lindmaniana, known hitherto from Loma del Gato, is endemic to eastern Cuba.

Lepanthes longicruris Schltr. No. 612 (Hb. Ames 68582).

An endemic of Provincia del Oriente, this species has been reported previously from Loma del Gato and San Juan.

Calanthe mexicana. Drawn by G. W. Dillon.

Lepanthes pergracilis Schltr. No. 600 (Hb. Ames 68359; 68360); No. 765 (Hb. Ames 68358).

Lepanthes pergracilis has been cited previously from Cuba only from Pico Turquino. This second report—from the neighboring peak of Bayamesa—emphasizes its endemism in easternmost Cuba.

Lepanthopsis microlepanthes (Griseb.) Ames. *Pleurothallis microlepanthes* Griseb.

Lepanthes Leonii Schweinf. ex León. No. 602 (Hb. Ames 68579).

Lepanthopsis microlepanthes, described originally from Jamaica, has since been collected in eastern Cuba (Garay in Orch. Journ. 2 (1953) 468), where it is known from Loma del Gato and La Bayamesa.

Malaxis domingensis Ames. No. 606 (Hb. Ames 68230).

The type of *Malaxis domingensis* is from the Dominican Republic. It has been known from Pico Turquino in Cuba.

Malaxis umbelliflora Swartz. No. 604 (Hb. Ames. 68357). No. 606A (Hb. Ames 68231). No. 749 (Hb. Ames 68356).

Malaxis umbelliflora is known throughout the West Indies, from Cuba to Trinidad. From Cuba, it has been collected only in the Provincia del Oriente: from Lomo del Gato and Sierra de Nipe.

Pleurothallis prostrata Lindl. No. 613 (Hb. Ames 68584).

Pleurothallis prostrata is apparently a rare endemic of the Provincia del Oriente. It seems to have been collected previously only by Wright a century ago.

Pleurothallis racemiflora (Sw.) Hook. No. 599 (Hb. Ames 67882; 68363).

Pleurothallis racemiflora, known also from Jamaica and questionably from Venezuela, is not uncommon in the Provincia del Oriente. It has been reported from Pico Turquino, Sierra Maestra, Lomo del Gato and Gran Piedra.

Pleurothallis ruscifolia (Jacq.) R. Br. No. 608 (Hb. Ames 67878; 68233); No. 787 (Hb. Ames 68353); No. 798 (Hb. Ames 68352).

Widely dispersed in the West Indies, Middle and tropical South America, this species of *Pleurothallis* has been collected in Cuba only in the Provincia del Oriente, where it has previously been known from Pico Turquino and Loma del Gato.

Psilochilus macrophyllus (Lindl.) Ames. No. 605 (Hb. Ames 68350).

Psilochilus macrophyllus, ranging through the Antilles and tropical parts of Middle America to Venezuela and Peru, has been collected in Cuba only in the Provincia del Oriente from Sierra de Nipe, Baracoa, Pico Turquino, Loma del Gato and Pico de La Bayamesa.

Stelis ophioglossoides Swartz. No. 610 (Hb. Ames 68580).

Widely distributed in the West Indies and British Guiana, *Stelis*

ophioglossoides is known in Cuba apparently only from the more tropical Provincia del Oriente. Mr. Garay, who determined the collection cited above, indicates that it is a "small form" of the species.

Xylobium palmifolium (Sw.) Benth. ex Fawcett. No. 700 (Hb. Ames 68234); No. 793 (Hb. Ames 68365).

This species, cited from Cuba by Fawcett & Rendle, is rare on the island. There has been no Cuban representation of it in the Ames Herbarium, and both Acuña and Brother León, in citing it, indicate that they have seen no specimens of it. It is known also from Jamaica, Haiti, the Dominican Republic and Trinidad.

NOTEWORTHY HEPATICAE FROM VIRGINIA

R. M. Schuster and P. M. Patterson[1]

The bryophytes, and mosses in particular, have been collected over various parts of the state during the past few years (Patterson 1950, 1951, & 1955). While many species have been reported, many others are expected to occur, particularly in unusually favorable habitats. Judging from past explorations, among the more critical areas in the state are the Dismal Swamp and adjacent territory of the southeastern coastal plain from which more range extensions may be expected; and White Top and Mt. Rogers, the highest points in Virginia, where bryophytes typical of the northern coniferous forest have been found as well as a group of species endemic in or disjunct to the southern Appalachians.

This paper reports the results of collections from each of these areas. The Dismal Swamp area was visited on April 2 and 3, 1955, and the mountain peaks on June 9 & 10, 1956. Collections were made in the Dismal Swamp in the mature forest on the east side of Lake Drummond between the origins of the Feeder and Portsmouth Ditches. The area designated as Nansemond (County) is a small area of swampy streams and fields to the immediate north and northeast of Cypress Chapel in the agricultural area reclaimed from the Dismal Swamp. The third place visited was the northern edge of the Seashore State Park along Route 60; this is at the northern tip of Cape Henry in

[1] University of Massachusetts, Amherst, and Hollins College, Virginia, respectively. The specimens validating this report are deposited at the authors' respective institutions.

Princess Anne County, east of the city of Norfolk. It includes both swampy forest and sandy, xeric habitats.

The peaks of White Top and Mt. Rogers are bisected by the Smyth-Grayson County line in the southwestern part of Virginia. Their altitudes are 5520 and 5720 feet respectively. The summit of White Top is dominated by nearly a pure stand of *Picea rubens* Sarg. and offers a variety of microhabitats, including exposed rock outcrops such as ledges and small cliffs, some of which remain permanently wet with seepage. Mt. Rogers is capped with almost a pure stand of *Abies fraseri* (Pursh.) Poir., an endemic of the southern Appalachians. Both stands seem to be virgin with windfall thinning the peak of Mt. Rogers. The latter peak is soil covered with occasional shaded, but dry boulder outcrops. White Top is easily reached by a road to the summit whereas Mt. Rogers has been visited much less frequently by botanists since it is approached by an unmarked and rather difficult logging road, and the peak must be ascended on foot.

This report also includes two new records for Virginia made by the authors, independently, at other localities. Since a number of reports below are of a peripheral character establishing these species at new limital points, and since the ecology of the species at such limital points is poorly known, we have given the common associates, and in the case of epiphytic species, the host trees. Since some of the species at the limits of their ranges are often found as impoverished, sterile, and hardly typical phases, we rather fully document the bases for our reports. Thus we hope to avoid the ambiguity that characterizes many local lists.

Lophozia incisa (Schrad.) Dum. Previously reported only from White Top, was found again here on rotten wood with *Anastrophyllum michauxii* and *Tritomaria exsecta*, (RMS *38088*, *38100;* PMP *2787*). Mt. Rogers on rotten wood with *Harpanthus scutatus* and *Geocalyx graveolens* (RMS *38035*, *38036a*, *38043a;* PMP *2759*).

Lophozia silvicola Buch. Bedford County, Peaks of Otter near summit of Sharp Top under a shading rock (RMS *28597*). These plants show the typical narrow-leaved phase, with yellow-green gemmae, and spherical, bi-concentric oil bodies. This species has not been reported previously in North America outside of Minnesota, Wisconsin, and Michigan. Schuster has also found it on Roan Mt., Mt. Mitchell, Mt. Leconte, and Grandfather's Mt. in North Carolina and Tennessee.

Solenostoma (*Plectocolea*) **obscurum** (Evans) Schuster. White Top on

side of cliff at summit (RMS *38073*), male and female plants intermixed with *Scapania undulata;* (RMS *38098*) with *Calypogeia fissa;* (RMS *38051*) with *Marsupella emarginata;* (RMS *38055a*) with *S. undulata;* and (PMP *2790*) with *S. undulata.* The material of *38073*, *38098* and *2790* is atypical in the rotundate or nearly rotundate leaves, suggesting *S. hyalinum* which was also collected. However the rhizoids have the intense violet coloration characteristic of *S. obscurum.* In *38098*, a few weathered, but typical perianths are present which are very short and included. The smaller cells, 19–20μ on the margin and 21–34 $\times$ 23–30μ medially definitely eliminate *S. hyalinum.* This species has not been reported south of northern New York and the New England states, but Schuster has collected it in both North Carolina and Tennessee.

Nardia lescurii (Aust.) Underw. This was collected from large mats in a shaded roadside ditch in Nansemond County (RMS *34502*, *34505*, *34507*, *34509;* PMP *2686*). Previously reported from the mountains in Botetourt County, and from the outer Piedmont in Spottsylvania County; this is the first report of this primarily montane and Appalachian species from the outer coastal plain. It was associated with *Scapania nemorosa, Microlepidozia sylvatica, Cephalozia macrostachya, Telaranea nematodes, Calypogeia sullivantii, Odontoschisma prostratum, Sphagnum subsecundum* and *Ditrichum pallidum.* The plants were dioecious but bore mature sporophytes. The species is easily distinguished from *N. geoscyphus*, with which it is often confused in the southeast, by the uniformly emarginate leaves, the dioecious inflorescences, and the presence of 2–6 papillose-segmented oil bodies in each cell.

Anastrophyllum (*Sphenolobus*) **minutum** (Cr.) Schuster. White Top on shaded cliff near summit with *Herberta tenuis* and *Bazzania denudata* (RMS *38099*); Mt. Rogers on the shaded vertical face of a large boulder at the lower edge of the Abies fraseri zone, (RMS *38021;* PMP *2752*). This is the first report of this species in Virginia. It occurred in very small quantity but has the typical bright scarlet gemmae masses in *38099*. Nos. *38021* and *2752* are the green shade form with complicate but not cupped leaves with cuspidate lobes. Here the gemmae, apparently owing to development in deep shade, are a pale red.

Marsupella paroica Schuster. White Top on dry rocks and ledges near summit with *Blepharostoma* (RMS *38092*, *38064*, PMP *2794*.) Mt. Rogers at very summit with *Tritomaria exsecta, Blepharostoma,* etc. (RMS *38025a*). This is the first report of this recently described species in Virginia. For its description, see Schuster (1957). In the southeast, this species has been confused with *M. emarginata* but can be distinguished by the small size of *M. paroica,* by its paroecious inflorescence, asymmetrically bilobed leaves, and capsule wall anatomy.

Anomylia cuneifolia (Hook.) Schuster (*Mylia cuneifolia* (Hook.) S. F. Gray). Mt. Rogers on trunk of *Abies fraseri*, at summit, in minute quantity; occurring principally as isolated strands among *Frullania asagrayana, Plagiochila tridenticulata, Bazzania nudicaulis, Herberta tenuis* and *Paraleucobryum longifolium* (RMS *38002*, *38003*, *38011*). This is the

northermost report in the New World of this minute but distinctive species. Previous collections have been from the higher peaks of the mountains of western North Carolina and eastern Tennessee.

Plagiochila sullivantii Gottsche ex Evans. White Top near summit in a damp recess in a cliff with *Metzgeria hamata*, *Radula tenax* and *Bazzania denudata* (RMS *38083;* PMP *2791*). This collection agrees closely in all respects with the type material except that the caducous leaves are rare or absent. Aside from Sullivant's No. 219 it has been reported in Virginia only from the Shenandoah National Park.

Plagiochila yokogurensis Steph. subsp. **fragilifolia** Schuster. Dismal Swamp on tree trunks with *Radula obconica, R. caloosiensis, Cololejeunea biddlecomiae* (RMS *34561*, PMP *2650*). Nansemond County on bases of trees along swampy streams (RMS *34514*; PMP *2678*, *2689*). For a description of this plant see Schuster (1957a). A number of collections, some of which were reported under other specific names for Virginia belong here. Earlier collections in the Dismal Swamp (PMP *1564*, *1736*); Spottsylvania County in the outer Piedmont (*Iltis 3806*); in Henry County in the southwestern Piedmont apparently on igneous rock (PMP *1450*); and in the southern Valley region of Virginia on limestone (Rockbridge County, *R. P. Carroll 158*, and Roanoke County, PMP *R-395*, *1457*). Virginia and the District of Columbia is as far north as this plant is known to extend.

Cephaloziella byssacea Roth Warnst. var. **scabra** (Howe) Schuster. Seashore State Park in dry, sandy opening under *Quercus virginiana* Mill.; it was dispersed in cushions of *Dicranum condensatum* and *Leucobryum glaucum* (RMS *34557a;* PMP *2669*). This is the first report of the variety in Virginia. The plants were sterile but represent the extreme scabrous phase with very coarse cuticular papillae and cellular outgrowths on the postical face of the leaves. Typical *C. byssacea* was found nearby (RMS *34557*) which was bearing perianths but showed no intergradation with the variety.

Cephalozia macrostachya Kaal. Nansemond with *Nardia lescurii* and other associates listed there (RMS *34506, 34507, 34501, 34509;* PMP *2681*). This has been reported for the state by Evans (material in United States National Museum), and has a sporadic range as yet unreported in the southeastern part of the United States. This plant is not wholly similar to the northern *C. macrostachya*, which grows exclusively in bogs. However it can not be placed in the more common and allied *C. catenulata* because of the very large cells of the stems and leaves. (Schuster 1949). The taxonomy of this complex needs further study.

Microlepidozia sylvatica (Evans) Joerg. Nansemond County on soil, roadside ditch, mixed with *Cephalozia macrostachya, Odontoschisma prostratum, Ditrichum pallidum* and small amounts of *Leucobryum glaucum* and *Atrichum undulatum* (RMS *34501, 34509 p.p.;* PMP *2684*). This species is rare and sporadically distributed in the coastal plain although found as far south as central Florida. The present collections are of particular interest in that some leaf cells and cortical stem cells show several small, homogeneous oil bodies per cell. This finding contradicts

the contention of Müller (1939) that *Microlepidozia* lacks oil bodies. Schuster and Blomquist (1954) have pointed out that the related *M. setacea* also has oil bodies present.

Telaranea nematodes (Gottsche ex Austin) Howe. Nansemond County, at the same site as the above and scattered in small quantity among *Nardia lescurii* and *Cephalozia macrostachya* (RMS *34506, 34516;* PMP *2688*). This has been collected in Virginia in four localities in the coastal plain. It seems to be infrequent as well as easily overlooked.

Calypogeia suecica (Arn. & Perss.) K. Müll. Mt. Rogers on decaying *Abies fraseri* logs with *Cephalozia catenulata* and *Nowellia curvifolia* (RMS *38040;* PMP *2753*). This small species is reported for the first time in Virginia: an earlier report of it is in error. The material is altogether typical. It is rather frequent at high elevations in western North Carolina and eastern Tennessee and has been found by Schuster as far south as the Estatoe River ravine in South Carolina.

Calypogeia neesiana (Massal. & Carest.) K. Müller. White Top, peaty soil over shaded ledges near summit (RMS *38062, 38066, 38071, 38075*); Mt. Rogers, at the lower edge of the fir zone with *C. fissa* (RMS *38020*). The plants of the latter collection are somewhat bluish gray when mature, and dull when dry. This is an extreme phase with the marginal cells of the leaves rarely differentiated. The White Top plants are in part abnormal. No. *38075*, which is in fruit, shows the prominent nodular thickenings of the longitudinal walls of the epidermal cells of the capsule wall and the spores measure 12–13μ. The marginal cells of the leaves are developed locally to a very limited extent. This is also true of No. *38066* which superficially approaches *C. muelleriana* from which this collection is distinct in the dull texture when dry. The plants of No. 38066 have a spring growth of very broad, large-celled, non-bordered leaves which are occasionally incised. The underleaves are somewhat more frequently incised. The material surely belongs here although in many respects it is abnormal. No. *38071* has these same characters but with the underleaves unusually emarginate and with the lateral leaves broad and dense. Here the "border" of the leaves is locally distinct only in the more normal summer or fall growth. No. *38062* shows similar variations in that the spring growth has broad, very polymorphous leaves which are often emarginate at the apex and without the trace of a border. The summer or fall growth, however, has narrower leaves which are often bordered by elongated cells, with underleaves subentire.

This critical series of specimens demonstrates again how exceedingly technical this genus is. This material shows superficial tendencies to grade into *C. muelleriana* (from which it differs in texture and capsule wall anatomy, for instance), but not toward *C. meylanii*, which is as yet unknown from the southern Appalachians.

There is an earlier report of *C. neesiana* from Giles County (Carroll No. *275*). Another collection from Giles County, (PMP *2727*), has the leaf shape, leaf tips and well developed leaf border on most of the leaves that is nearly typical of *C. neesiana*, however the underleaves are bidentate

suggesting *C. muelleriana*. The oil bodies are colorless, compound, chiefly fusiform in shape and rather large, they are mostly 8–11μ long and 4–5 per cell, while some are smaller. They are present in all leaf cells but absent in the underleaves.

Calypogeia sullivantii Aust. Nansemond County, roadside ditch with *Nardia lescurii* etc., (RMS *34502*). It is very unusual to find this plant in the outer coastal plain. It is very largely Appalachian in this area but extending toward the coast northward. The nearest collections in Virginia are on the outer Piedmont in Chesterfield and Henrico Counties.

Calypogeia fissa (L.) Raddi. White Top, on cliffs near summit, traces scattered in *Solenostoma obscurum* (RMS *38098*); Mt. Rogers (RMS *38020a*). This represents the nearctic race, as yet undescribed, with pointed leaves that are only occasionally bidentate; the oil bodies are colorless; the underleaves are transverse, often with obtuse lateral lobes. Some of the southeastern reports of *C. fissa* are in reality *C. portoricense;* thus the southeastern range of *C. fissa* is quite uncertain.

Radula caloosiensis Aust. Dismal Swamp (RMS, *34528 a & b*, *34529a*, *34531*, *34559*, *34560*, *34532*, *34539*, *34553a*, *34555*, *34561a;* PMP *2660*, *2664*, *2668*). Nansemond (RMS *34503*); Seashore State Park (PMP *2671*). This plant occurred frequently and is associated with *Plagiochila yokogurensis* subsp. *fragilifolia*, *Cololejeunea biddlecomiae*, *Rectolejeunea maxonii*, *Radula obconica*, and such mosses as *Anomodon minor* and *Schwetschkeopsis denticulata*. It was growing on such trees as *Betula lenta*, *Acer saccharinum*, *A. rubrum*, and *Nyssa sylvatica* var. *biflora*. This is the first report in Virginia which locality is at its northernmost known limit. This species occurs as the brittle, bronze phase described by Castle (1925) as *R. langloisii*. The study of large quantities of material by Schuster has shown that this plant cannot be separated from *R. caloosiensis* so must be regarded as ccspecific.

Frullania inflata Gottsche. Nansemond (RMS *34521b*). Found with capsules and androecia and associated with *Frullania brittoniae*, *F. squarrosa*, *Leucolejeunea unciloba* and *Cololejeunea biddlecomiae* and *C. minutissima*. This is a noteworthy citation as it seems to be rare in the state; it has been reported from only three collections in the Piedmont.

Frullania tamariscii (L.) Dum. Dismal Swamp (RMS *34546*). It was growing on *Nyssa sylvatica* var. *biflora* with *Leucolejeunea clypeata*. The plants are typical with female bracts sharply serrated and pointed, the branch leaves with apiculate tips, with large styli, and with the underleaf margins reflexed distally. This is the second report from Virginia.

Frullania plana Sull. Mt. Rogers (RMS *38031a*). Growing on the trunk of a large *Aesculus octandra* 5–7 feet above the base with *Porella platyphylloidea*, *Radula complanata*, *Cololejeunea biddlecomiae*, *Metzgeria fruticulosa*. Reported from four collections in three counties in the western part of the state on boulders, this collection represents the decidedly rare, reddish-brown, corticolous phase of the species.

Frullania saxicola Aust. Roanoke County, on shaded limestone ledge above Tinker Creek near Hollins (PMP *2795*). While this taxon is ex-

ceedingly close to *F. inflata* it is easily separated by the numerous clavate papillae that close the perianth mouth. For a discussion of these differences, see Schuster (1953).

Frullania oakesiana Aust. White Top (RMS *38063, 38068, 38070, 38088a, 38090, 38091;* PMP *2780 & 2783*). Mt. Rogers (RMS *38011, 38014, 38024*). The White Top collections were from *Sorbus americana, Acer spicatum, Betula lutea,* and were associated with *Frullania asagrayana, Metzgeria crassipilis, F. eboracensis, Ulota crispa* and *Sematophyllum adnatum.* The collections on Mt. Rogers grew on *Sorbus americana, Betula lutea* and *Abies fraseri* with *Frullania asagrayana, F. eboracensis, Ulota crispa,* etc. This is a well marked species and occurred in normal condition. It has not been reported south of western New York. This is the first report for Virginia although Schuster has collected it in North Carolina and Tennessee on Roan Mt., Mt. Mitchell, Clingman's Dome and Andrews Bald. In the southern Appalachians it seems to be limited to the spruce-fir zone.

Frullania obcordata Lehm. & Lindb. Dismal Swamp (RMS, several collections; PMP *2659 and 2672 p.p.*). Seashore State Park (RMS *34551a, 34553;* PMP *2674*). The Dismal Swamp collections occurred on *Ilex opaca* in isolated, nearly pure colonies. In Seashore State Park on *I. opaca, Acer rubrum* and *Quercus* with *Frullania kunzei, Leucolejeunea unciloba, Leptocolea cardiocarpa* and *Cololejeunea minutissima.* This species is new to Virginia and this area represents the northernmost known extension in range.

Lejeunea (*Microlejeunea*) **bullata** Tayl. Dismal Swamp (RMS *34545*). It was growing on *Ilex opaca* with *Metzgeria furcata* var. *ulvula* and *Frullania brittoniae.* This is the northernmost valid station for this species and the first report for Virginia. The mature plants have one oil body per cell and median leaf cells are 12–13.5μ wide. The ocelli of the antical leaf base vary from 1–4, usually 2–3 per leaf. The larger number of ocelli are very rarely found, otherwise the plants are quite typical.

Cololejeunea minutissima (Smith) Schiffn. subsp. **minutissima.** Dismal Swamp (RMS *34550, 34552c, 34553, 34556, 34563;* PMP *2653, 2654*); Seashore State Park (RMS *34553 p.p.;* PMP *2676*); Nansemond (RMS *34521*). It was found growing on *Ilex opaca, Nyssa sylvatica* var. *biflora, Asimina triloba,* and *Acer rubrum* with the usual associates including *Leptocolea cardiocarpa, Cololejeunea biddlecomiae, Lejeunea flava, Metzgeria furcata ulvulva, Frullania kunzei,* etc. For the synonymy of the groupings under this species see Schuster (1955). Here also is listed the Virginia collections along with the occurrence of *Frullania obcordata* and *Leptocolea cardiocarpa.* The above is the first report for Virginia and represents its northernmost valid locality. All of these plants are quite typical except that RMS 34530c has the discoid gemmae as illustrated in the paper cited above. These gemmae are 25–32 celled and arise from the antical face of the lobe, on the marginal cells, and on the abaxial face of the lobule.

Leptocolea cardiocarpa (Mont.) Evans. Dismal Swamp (RMS *34529, 34542, 34556, 34563;* PMP *2644, 2657, 2663,* 2665); Seashore State Park

(RMS *34551;* PMP *2675*). Growing on the same types of trees and with the same hepatics as noted above except for the additional occurrence on *Berchemia scandens* where it was growing as isolated small patches. This is another northward extension in range and first report for Virginia.

Riccardia palmata Hedw. White Top (RMS *38053, 38103;* PMP *2774*). It was growing near the summit on a decaying moist log with *R. latifrons, Cephalozia catenulata,* and *Nowellia curvifolia.* The plants are typical, possess capsules and slender androecial plants. Trustworthy reports of this species in the southeast are very few. The majority of the specimens are referable to *R. latifrons* or even *R. multifida* vars.

Metzgeria hamata Lindb. White Top (RMS *38050;* PMP *2773*). On treebase by brook just below the spruce forest at summit. Alt. ca. 5000 ft. Growing with *Lejeunea lamacenna* var. *geminata, Radula tenax,* and *Plagiothecium denticulatum* in beech woods. This tropical species is extremely rare north of the montane parts of Tennessee and North Carolina. The only other report for Virginia is at the Breaks of the Cumberlands at the junction of the Virginia, West Virginia, and Kentucky borders.

Metzgeria fruticulosa (Dicks.) Evans. Mt. Rogers (RMS *38028, 38031;* PMP *2764, 2768*). Near the summit on the barks of *Aesculus octandra, Betula lutea, Fagus grandifolia* and *Acer saccharum,* growing with *Frullania plana, Porella platyphylloidea, Radula complanata, Cololejeunea biddlecomiae, Metzgeria crassipilis, Leucodon julaceus* and *Pylaisia* spp. This species has been reported once before in the state in Giles County. It is extremely rare north of the montane portions of Tennessee and North Carolina, where it has been overlooked previously. It occurs at much higher elevations than the ubiquitous *M. furcata* and has quite a different ecology. The arbitrary position of Frye & Clark (1937) in placing this as a variety of *M. furcata* indicates a lack of understanding of the nature of this species.

Metzgeria myriopoda Lindb. Dismal Swamp (RMS *34529, 34530, 34531, 34541, 34545, 34562, 34537;* PMP *2652*). Growing on *Nyssa sylvatica* var. *biflora* with *Anomodon attenuatus, Radula caloosiensis, R. obconica, Rectolejeunea maxonii;* Nansemond County, as noted for *R. caloosiensis* in similar ecology (RMS *34511, 34514a*). This plant is new to Virginia and is an extension of its range to the north, Frye & Clark's (1937) reports for the District of Columbia and Quebec are in error. The plants are often rather impoverished and approach *M. furcata* from which they differ in the convex branches with the marginal hairs 2–3 per cell. The frequent geminate marginal hairs suggest *M. conjugata* from which the oval, short gemmae and uniform sterility serve to distinguish these plants. Occasional plants (RMS *34537*) exhibit a few ultimate branches, bearing short, oval gemmae and have the facies of a form of *M. fruticulosa.*

Sphaerocarpus terrestris Bisch. (*S. texanus* Aust.). Nansemond, moist, sandy soil near the end of an unplowed field (RMS *36675* PMP *2690*). Colonies small to large and in abundance, with immature sporophytes. This plant has been collected as far north as Middlesex County near Saluda south of the Rappahannock River terminus in minute quantity.

This collection confirms the presence of this species near the edge of its reported range northwards in eastern United States.

It may be noted in passing that previous reports of *Ptilidium ciliare* (L.) Nees for the state, duplicates of which were obtained on loan from the New York Botanical Garden (for which appreciation is here expressed), and examined by the second author, all proved to be *P. pulcherrimum* (Web.) Hampe, a species of scant occurrence in the state. Thus the reported bryophytes for Virginia now stand at 512 with the hepatics at 147.

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MONOTROPSIS LEHMANIAE NOT A REAL SPECIES

J. T. BALDWIN, JR.

BURNHAM (1906) described *Monotropsis Lehmaniae* as a new species, separated from *M. odorata* Ell. by having the corolla "but half the length of the sepals, and the lobes . . . more deeply divided." Moreover, the flowers of the new plant were scentless and "never appear until about the 20th of September." Burnham's initial impression was that only in the time of flowering did the specimens sent to him by Miss E. A. Lehman from the

region of Elkin, North Carolina, differ from typical *M. odorata* (letter of September 24, 1906, to Miss Lehman, of which a copy is in the Wiegand Herbarium of Cornell University). Almost certainly he based his new species on immature plants of *M. odorata*, and the characters he used to separate the plants change with the ontogeny of the individual and hence are not reliable for taxonomic purposes.

Wolf (1922), after many years of observation of *M. odorata* in Alabama, concluded from misstatements in the literature that the plant was new to science and accordingly described it as *Cryptophila pudica.* Though both Small (1933) and Spawn (1938–1939 ?) correctly cited *Cryptophila pudica* as a synonym under *M. odorata*, neither of these authors seemed to appreciate the value of Wolf's data: his records, in my opinion, clearly demonstrate that *M. Lehmaniae* is a not a true species. Wolf stated: "The season of the plant extends from the fall of the one to the summer of the next year, and is autumno-hyemal with reference to appearance of scapes and their full development, vernal with respect to anthesis, aestival as to ripening of fruit. The earliest date recorded of scapes observed above ground is September 12th . . . The scapes grow slowly to about normal size while the flower buds become fairly developed—sepals more or less to full size, corolla to about two-thirds of the full length. The winter is then passed by the plant in apparent dormancy till March or the approach of April." He observed that a cover of leaf mold was necessary for protection of the plant during the winter.

Monotropsis odorata is a fairly common plant in the environs of Williamsburg, James City County, Virginia (Erlanson, 1924; Artz, 1934; Fernald, 1943). I have known the plant here since 1939 and have come to expect it to appear through the covering of leaves during the latter half of February and to attain full development some weeks later. During the past season I have discovered that by raking away the leaf mold one can find the plant from fall through to the time it normally appears. Plants exposed during the winter were killed.

I have recently examined the following specimens from the Williamsburg stations:

Grimes 3269 NY, Feb. 28, 1921; *3282* GH, March, 1921. *Fernald, Long & Abbe 14209* US, GH, April 19, 1942. *Baldwin 12* GH, Feb. 19, 1939; *12571* US,

Feb. 18, 1949; 15048 NY, K, GH, Feb. 26, 1956; *15086* GH, Nov. 21, 1956; *15087* GH, Dec. 27, 1956; *15088* GH, Dec. 31, 1956; *15089* GH, April 6, 1957.

Baldwin 15088, collected December 31, 1956, has the calyx exceeding the corolla, and the corolla lobes about equal the corolla tube. *Baldwin 15089*, collected on April 6, 1957, from the same colony, has the corolla exceeding the calyx and the corolla lobes half the length of the tube. In other words, in the time interval of more than three months these relative lengths have changed significantly. These are not, therefore, reliable taxonomic characters in *Monotropsis*, but they are used in all the keys that attempt to differentiate among the three species that have been described: *M. odorata*, *M. Lehmaniae*, and *M. Reynoldsiae* (A. Gray) Heller.

As the name connotes, *M. odorata* has odoriferous flowers. Copeland (1939) claimed that various writers, beginning with Stephen Elliott who described the species, have mentioned that the flowers smelled like violets. Plitt (1909) wrote that as he knew the plant in Maryland it had a "delightful fragrance, cloverlike . . . perfuming the air for some distance around." A. V. Smith (conversation) said that he had on occasion in Maryland found the plant by first detecting the aroma. Wolf (1922) considered that his Alabama plant had an odor of cloves. A notation on *A. M. Huger* 17 NY—a specimen of *M. odorata* collected near Hendersonville, North Carolina, in 1898, reads: "Is *always* deliciously fragrant—a very *rich & spicy* odor." This last description coincides with my concept of the plant at Williamsburg except that specimens collected in November and December of 1956 (cited above) had no discernible odor.

Baldwin 15086 consists of several plants discovered under a rotten log which W. Leslie Burger turned over in search of herpetological specimens; though these plants were kept in a warm laboratory for a number of days, they developed no odor. *Baldwin 15087* consists of plants from the same colony as *15086* and were odorless; they were found by raking away the leafmold cover. *Grimes 3282* was found at the same station in March, 1921: "Shore of Tutters Neck Pond, S. E. Williamsburg"; M. L. Fernald (letter of June 27, 1949, to me) identified *Grimes 3282* as *M. odorata*. The specimens constituting *Baldwin 15088* were found just west of Williamsburg by raking away leaves and debris; they came from the same colony that supplied specimens

for *Baldwin 12571*, *15048*, and *15089*. The last three numbers had the odor that characterizes the species; no odor could be detected for *15088*. The conclusion seems inescapable that *M. odorata* does not have its fragrance until anthesis, *i.e.*, in late winter and spring. Miss Lehman, collecting the immature plants upon which Burnham founded his species, correctly noted that they were scentless.

Neither morphological characters of flowers, nor time of flowering, nor absence of odor are legitimate bases for maintaining *M. Lehmaniae* as a good species.

Spawn's (1938–1939 ?) distribution map for the representatives of *Monotropsis*, already weak at the time of publication because of inadequate attention to collections and careful records, needs further revision if my reduction of *M. Lehmaniae* is accepted.

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Echinochloa Walteri in Concord, Massachusetts.—Attention previously has been called to the probable effect of sewage pollution of the Sudbury-Concord River system in eastern Massachusetts on certain elements of its aquatic and riparian vegetation assumed to be due to a change from a natural slightly acid to a neutral or even basic environment supplied by the decomposition of sewage wastes. (Eaton, 1947).

Another probable instance of this phenomenon is suggested by what I imagined to be the initial discovery in 1956 of an abundant stand of *Echinochloa Walteri* (Pursh) Nash on moist gravel along a low impoundment dyke at the Great Meadows National Wildlife Refuge in Concord. A specimen collected by the author on September 10, 1956, has been placed in the Herbarium of the New England Botanical Club. Professor G. L. Church has kindly verified the determination.

Because the species occurs chiefly in basic to alkaline marshes, swamps and shallow water and appears to be local and uncommon north of Cape Cod, I have explored the possibility that it may have been an intentional or casual introduction in connection with recent wild fowl management and research activities at the Refuge. Correspondence with the Refuge Manager (Mr. Gorton Nightingale) and the Project Leader, Massachusetts Division of Fisheries and Game Field Headquarters (Mr. David Grice), elicited the information that a few plants were noted on the spoil bank of an artificial ditch in the meadows by Dr. John W. Brainerd in August, 1950. The ditch was blasted in October, 1949. Furthermore, a student assistant, Mr. Waldo Kennedy, is quoted as reporting its occurrence in two areas of the meadows in 1950, regarding its abundance to be "4" in each area. For a matter of comparison, he also designated *Carex comosa, Cicuta bulbifera, Bidens* spp. as "abundance 4." From my own observation these latter species are common in the Great Meadows wherever conditions are suitable. Hence, it seems likely that *E. Walteri* occurred there in 1950 not uncommonly in several and perhaps many localities. Nightingale writes, "This station's records disclose no planting of any sort done at the Great Meadows refuge by the Federal Government at any time and more specifically since its acquisition in 1944." Grice writes, "The state has made no plantings of any kind at Great Meadows," except for a small seeding of *Bromus* sp. in the summer of 1955 in the course of repairs to the lower dyke about one half mile downstream. Grice did bait his duck-banding traps with whole kernel corn (maize), occasionally substituting cracked corn or scratch feed, and in 1951 experimenting with barley and buckwheat. The scratch feed was a standard Wirthmore product tagged as containing cracked corn, wheat, oats and barley. It, as well as the barley and buckwheat, was supplied by a West-

boro grain dealer who writes "There is a possibility that some other seed which we sell may have fallen into the scratch feed we sold Mr. Grice. Most likely, if any did it would be Jap Millet, Hungarian Millet, Timothy, Red Top, Alsike Clover, Red Clover, Winter Rye, or Buckwheat." These are all commercial grains or grasses raised mostly on inland farms for the seed trade. I consider it reasonable to dismiss from consideration the possibility of their contamination with a native coastal plain species chiefly of basic to alkaline marshes and shallow water, which apparently seldom exhibits a weedy behavior.

It should be noted at this point that the Great Meadows are usually covered by the flood waters of the river from January through April. When the waters recede below the dykes, the shallow impoundments are chiefly fed by a small brook and all the filtrates from adjacent filter beds maintained by the Concord Sewer Department serving a population of some 10,000 people.

This grass, occurring chiefly in basic to alkaline marshes, swamps, and shallow water, ranges northward from Texas and Florida along the coastal plain to southern New England and disruptedly from southwest Quebec, central New York, to Wisconsin and Minnesota—a familiar distributional pattern. A significant number of these southern coastal plain plants reach the Merrimac River estuary (or beyond) and extend up its valley into southern New Hampshire and up its tributary, the Concord River, to Concord, Massachusetts, where they are usually uncommon and local. In the latter category, for example, are *Lycopodium inundatum* var. *Biglovii*, *Iris prismatica*, *Hibiscus palustris*, *Viola Brittoniana*, *Vernonia noveboracensis*, *Mikania scandens*, and *Liatris borealis*.

Thus it is not unreasonable to suggest that *Echinochloa Walteri* formerly was sparingly indigenous in Concord, although previously overlooked even by that indefatigable amateur student of Concord grasses of one hundred years ago, Mr. Edward S. Hoar, whose collections are preserved in the Club Herbarium. With the onset of river pollution ecological conditions, seemingly, have become more favorable for its development. Its present abundance, at least at the station where it was discovered, is somewhat confidently explained as a response to the pollution which also seems to account for the remarkable development of *Lemna*

minor and *Trapa natans* (op. cit.), the appearance of *Wolffia columbiana* in abundance (Eaton, 1939), as well as the increasingly conspicuous occurrence of *Potamogeton pusillus* (*P. panormitanus* Biv., cf. Eaton & Griscom, 1934), and *Phragmites communis* var. *Berlandieri* (Eaton, 1952).—RICHARD J. EATON, LINCOLN, MASSACHUSETTS.

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POLYGONUM BICORNE RAF. INSTEAD OF P. LONGISTYLUM SMALL.—*Polygonum longistylum* is a rather showy species, common in the Gulf Southwestern states. One would expect that such a plant must surely have been noticed earlier than 1894, when it was described by Small (Bull. Torr. Bot. Club **21:** 169; in 1903 transferred to *Persicaria*, in Fl. S. E. U. S. 377, 1330). As might be expected, the much abused Rafinesque had named it in his *Florula Ludoviciana*, p. 29, 1817, with a description that for him was exceptionally full and clear: "Caulibus ramosis, ramis geniculatis, patulis, teretibus, intus crenulatis; foliis petiolatis, lanceolatis, glabris; floribus spicatis confertis octandris, distylis, staminis inclusis, stylis exertis elongatis. Raf.—Renouée 1. Rob. p. 366. Large plant, four or five feet high, branches purplish, every one of which bears a fine, thick spike, about three inches long, of rose coloured flowers. This species, and all the following, grow in swamps, moist grounds, and along the rivers; they are called vulgarly *Curages*, in Louisiana; all their flowers smell like honey, and afford it in plenty to the bees. Blossoms from August to September." Later, under *P. vernum*, he adds: "This species, as well as the *P. bicorne* and *P. maculatum*, above, belong to the subgenus *Dioctus*, distinguished by having eight stamina, a compressed ovary and seed, two styles or stigmas, & c." In 1914 the new combination *Persicaria bicornis* (Raf.) Nieuwland was published

(Amer. Midl. Nat. **3:** 201), but otherwise Rafinesque's species has been completely ignored. This is a consequence of prejudice and ignorance: his description is unmistakable. The special condemnation of the *Florula Ludoviciana*, on the grounds that Rafinesque did not visit the state and saw no specimens, but named species on the basis of inadequate descriptions, is quite unjustified. Robin, upon whose *Flore Louisianaise* Rafinesque based his publication, was a serious amateur botanist who had studied Jussieu's textbook. He tells us that every description was made in the field, with the living plant before him ("Elles ont été faites sur les lieux, au milieu des bois et des prairies, et toujours en présence de l'objet que je décrivais. Si elles se ressentent à beaucoup d'égards des incommodités que j'ai dû éprouver, du moins elles ont pour elles la fidelité . . ."). Most of his descriptions are quite long—much longer than the abridged ones of Rafinesque. Though local uses of plants often make up a considerable portion of his accounts, the botanical information is still considerable—more ample, it may be remarked, than is to be found in Walter's *Flora Caroliniana*, which has been spared the obloquy awarded to Rafinesque. Even Linnaeus cites many descriptions from Bauhin and others which are far less intelligible than most of Rafinesque's, and Robin's originals are far more than we get in many sources quoted by Linnaeus. And Linnaeus likewise, in case after case, saw no specimens and never visited the native country involved. In further defense of the *Florula Ludoviciana*, it should be pointed out that the region covered is really quite restricted, and the main part of it relatively well known botanically: hardly a quarter of a century after its publication, considerable topotype material was available, by means of which the species could have been evaluated. Robin spent most of his stay in and around New Orleans, making only two long trips into the back country: one in early spring, up the Mississippi, Red, and Ouachita rivers to present Monroe, Louisiana; another just after mid summer (it was necessary to wait until the marshy country was dry enough for travel) nearly due west from New Orleans about half way across the state, then a little north to "the country of the Atakapas," to the south of present Opelousas. The deliberate disregard of nearly all of Rafinesque's

Louisiana species resulted from several causes, which unhappily still exist: a hostile prejudice against the man and his work; the rarity of copies of Robin's *Voyages* (no botanist to my knowledge went to the trouble of checking back to the original source; the lie that the descriptions were scrappy and inadequate has been monotonously repeated by persons who never saw Robin's 3-volume book); the paucity of collections and general lack of information (especially first-hand field acquaintance) about the Louisiana flora. On the basis of such limited studies as I have made so far, I am confident that most of the species of the *Florula Ludoviciana* can be satisfactorily identified. Since its early date (1817) gives it priority over most of the work of Elliott and all of that of Nuttall, Torrey, and Gray, there will undoubtedly be further name changes. Rafinesque himself did eventually see specimens from Louisiana, and was able to supply additional notes or confirmations for some of his *Florula Ludoviciana* species in the *New Flora of North America* and *Autikon Botanikon.* It is worth citing one extraordinary case in which Rafinesque was an excessive lumper. His *Oxalis sanguinolaria* (*Fl. Ludov.* 89) included what Robin had listed as two distinct species, not named. Rafinesque's abridged description makes it impossible to assign his name with precision. But Robin's ampler descriptions, for anyone who has seen the southeastern Louisiana spring flora, leaves not the slightest doubt that he was describing the very distinct *O. recurva* Ell. and *O. Dillenii* Jacq. var. *radicans* Shinners (for a key to these, see Field & Lab. **24:** 39–40, 1956). Rafinesque had been too conservative, and *Oxalis sanguinolaria* must be rejected as based on an inextricable mixture.—LLOYD H. SHINNERS, SOUTHERN METHODIST UNIVERSITY, DALLAS 5, TEXAS.

DENTARIA LACINIATA FROM SEED.—In a paper on the genus *Dentaria* in eastern North America, Montgomery* ascribes sterility to certain species, among these *D. laciniata.* He states that "pods may develop to a good size, but when the contents are examined, they will most frequently be found to contain aborted ovules," and that apparently mature seeds of *D. laciniata*

* Montgomery, F. H. 1955. Preliminary studies in the genus *Dentaria* in eastern North America. RHODORA **57**: 161–173.

from Ontario failed to germinate. Examination of pollen showed that "good pollen was the rule," but hand-pollination (both self-pollination and cross-pollination) was unsuccessful. It was found that disintegration of the cells of the embryo sac took place after reaching the 8-celled stage, resulting in abortion of ovules. The conclusion was reached that "the eastern North American species of *Dentaria* proved to be another example of a polyploid series [*D. laciniata* from Guelph, Ont., had 240 chromosomes] being sexually sterile" and that "undoubtedly they reproduce mostly, if not entirely, apomictically by vegetative reproduction, for which the nature of the rhizome seems admirably suited."

The question at once came to mind—if *D. laciniata* reproduces only vegetatively, how has it succeeded in migrating so far in post-Wisconsin time, and how can it be such a rapid and aggressive invader of disturbed woodlands?

Although *D. laciniata* may be sexually sterile in Ontario, it is not so in southern Ohio. In the spring of 1956, with the above question in mind, patches of flowering plants were examined and, in each case, some small plants with entire elliptic leaves were found. Below ground, these were connected with the germinated seed, the seed-coat, though torn, still recognizable. As a further check, seeds were collected later as they matured. Seeds are produced abundantly, and forcibly thrown to a distance of several feet by the sudden splitting and curling of the halves of the silique. Collection of several hundred seeds was easily accomplished by placing almost ripe inflorescences under a bell-jar to prevent escape of seeds.

Attempts to germinate the fresh seed in moist chambers were unsuccessful; refrigeration did not help. In consequence, seeds were planted in the open under natural conditions, one lot on May 30, another (of refrigerated seed) on July 14. In the fall, some of the seeds were dug up, but germination had not taken place. Early in March, 1957, leaves began to appear above ground in both plots. Viability was high, at least 80 per cent.

The seedling *D. laciniata* has unlike cotyledons; one is fleshy and remains in the seed-coat, the other grows a long slender petiole (length dependent on depth of humus or leaf-litter overlying seed bed) which pushes above ground as a narrow arch,

the young leafblade bent back parallel to the petiole, and hence is pulled out of the ground, after which it assumes an upright position. This single emergent cotyledon has an entire elliptic blade 3–10 mm. long. The plumule, at first inconspicuous, soon begins to develop into a rhizome which by mid-April may be several mm. in length. At this time, the subterranean cotyledon in the torn seed-coat is still present. Occasionally a leaf with entire or lobed blade arises from the young rhizome. More often, the green plant the first year has only the one emergent cotyledon. By late May, the seedlings die down; at this time the young rhizomes are about 5 mm. long.

The number of chromosomes of the sexually fertile southern Ohio plants has not been determined. It is entirely possible that they do not display as high polyploidy as do the more northern plants. *D. multifida* was shown to have different numbers in different specimens ($2n = 64$ and ± 112). Sexual fertility of *D. laciniata* (and perhaps of other species southward) necessitates a reconsideration of the question of hybrid origin of certain forms. It explains the rapid migration of the species.—E. LUCY BRAUN, CINCINNATI, OHIO.

A NEW BOTANICAL MASTERPIECE FROM DENMARK.[1]—Although on this side of the Atlantic we are not accustomed to seeing first-class illustrated floras or pictorials of plants, the European countries have long been known for their superbly illustrated floras. Perhaps this is a part of the secret affecting the considerably more widespread interest in botany on the eastern side of the ocean. Descriptions in words never can be made so explicit, even by a skilled taxonomist, that others, especially amateurs, do not have greater difficulties in identifying the plant than if pictures are included. Even a relatively inexact drawing is more desirable than are the most exact of terms, not only for the layman interested in naming the plants he finds but also for the specialist. This principle was understood by the first botanists, although most of their illustrations are not always impressive to their more sophisticated colleagues of to-day. Too many authors of floras in modern times seem to prefer many words instead of a simple picture.

The first printed herbals of the 16th century are often at the same time collections of artistic drawings, some of which were made by the greatest artists of the Netherlands. Some of these flower pictures by renaissance

[1] BOTANISK ATLAS. Danmarks daekfröede planter tegnede af Olaf Hagerup og Vagn Peterson.—Ejnar Munksgaard, Köbenhavn, 1956. 550 pp.

artists are still unsurpassed in their artistic quality, although it was not until the Linnaean system had been generally accepted that the scientifically most valuable botanical picture collections were published.

The largest and certainly the most superb of all pictorials ever published of the flora of a single country is the Flora Danica, which was begun by Professor Oeder in Copenhagen in 1761 and continued by several other Danish botanists during the 122 years that followed. This pictorial consists of 3240 large engravings of the higher and many lower plants of the Danish empire, including not only Denmark itself, but also Norway, the Faeroes, Iceland, Greenland, and the Danish West Indies (Virgin Islands). Many of the best artists of Denmark here made their everlasting contributions. A number of the volumes were also hand-colored by the artists. Pictures from Flora Danica hang on the walls of many outstanding homes in Scandinavia, and they were once used on Danish porcelain meant for the Russian court. A complete series of Flora Danica, uncolored, now costs several thousand dollars, while the rare colored editions are priceless.

Flora Danica never became popular, since its price was too high even for most botanical institutions. In this century, however, several Scandinavian institutions and homes were able to keep the series of more simple and smaller colored drawings of the flora of this part of Europe, initiated by the Swedish Professor Lindman. It was, however, not until the invention of the modern methods of reproduction of color photographs that such books became very popular. In America we have seen a great number of such books of low quality scientifically as well as artistically although some few first-class pictorials have been produced. But the undoubtedly highest quality in such books has been reached by the five magnificent volumes, "Vilda växter i Norden," initiated by the Swedish Professor Lagerberg and already published in two large editions in all the Scandinavian countries. Of high quality also is the popular flora of Sweden by Ursing based on colored drawings from color photographs, although its pictures are very small and not always very exact. This last book was a best-seller in Sweden—topping even the very best novels—for several years after the last war, and is probably found in the majority of Swedish homes.

Although the pictorials based on color photographs can be excellent, they never come up to the quality of the best drawings, and, because of their high printing price, the color pictures cannot be included in the common flora manuals. Therefore, despite the popularity of the colored pictorials, they have not eradicated the black-white drawings as botanical illustrations, but rather have enhanced their further development. Recent illustrations of this kind have been published in many European countries, but although the quality of them all has been kept very high, hardly any of them are characterized by the high scientific and artistic quality that is met with in the pictures by Dagny Tande Lid in the Norwegian flora by Lid, the Icelandic flora by Löve, and the Faeroes flora by Rasmussen.

The drawings by Mrs. Lid rarely fill a page, and some botanists have the feeling that they are reduced more than desirable although this cannot be avoided if the text is to be printed on the same pages. Therefore, in Norway and Great Britain somewhat larger illustrations are being published by Miranda Bödtker and Nordhagen, and Stella Ross-Craig, respectively, referring to already published manuals for the text. Both these publications are of the highest quality, although it must be said that their greatest disadvantage is their publication in small parts with long intervals between issues so that the complete floras will not be covered within a reasonable period of time.

Another work of this kind, though at once picturing all the higher plants of its region, has just been published in Denmark. It is a quarto-volume of 550 pages named "Botanisk Atlas," by Olaf Hagerup and Vagn Peterson. The first author is the head curator of the Botanical Museum in Copenhagen, the world-renowned author of a large number of scientific contributions, and the creator of some of the most fruitful ideas of modern botany, such as the hypothesis of difference in distribution of diploids and polyploids. The second author is an amateur botanist and an artist of high merit. Hagerup is responsible for the scanty text, the arrangement, the nomenclature, and all the many pictures of details and anatomical features, whereas Peterson has made the drawings of the entire plants and their main parts. Without going into detail, it can be stated that this new Atlas is comparable to nothing but the very best drawings in the classical Flora Danica, and even surpasses it many times in scientific exactness and perhaps also in the artistic quality of the detailed pictures drawn by Hagerup.

The text of the new Danish Atlas is as short as it can be, including the names of the plants in Danish and Latin, and very dry and short explanations of the figures. Somewhat more detailed descriptions are given of some of the pictures of characters typical of the families, and more particular information on the pollinating mechanisms—a speciality of Hagerup—is often included so that the reader here gets a small but very fascinating scientific report on these matters, some, at least, not previously published.

It cannot be expected that all the many drawings could be of the same high quality, and some of the pictures are perhaps rather dull and expressionless. This reviewer feels so about *Acorus Calamus,* which is shown only as a piece of the spathe with a spadix, and the same is true for *Rumex Acetosella,* which here cannot be separated from *R. tenuifolius* although the individual on which the drawing is based very probably belonged to the latter species. But the great majority of the pictures are of such a high quality that they can neither be described nor criticized, and especially all the drawings of details are so superb that nothing comparable to them has ever been published in such a book.

Because of Flora Danica, the Danish botanists have long been favored by being the owners of the most excellent and artistic pictorial ever published. Thanks to the united efforts of Hagerup and Peterson, their

publisher Ejnar Munksgaard, and the printer O. C. Olsen & Co., they are now also the possessors of the most valuable botanical atlas hitherto produced. It is indispensible not only for all European institutions, but also for all American botanists who need to make comparisons between American and European material. The Danish language is no obstacle to a foreign botanist since Latin names are international and almost all the details are self explanatory.—Áskell Löve. INSTITUT BOTANIQUE DE L'UNIVERSITÉ DE MONTRÉAL, MONTRÉAL, QUÉBEC.

A Needed Revision.[1]—This revision was started with Dr. Ogden shortly before Dr. Fassett's death, and offers a revision appendix to bring the taxonomy and nomenclature into agreement with present usage. The manual remains largely the same as the first edition. It is not a complete overhaul.

The appendix concerns not only changes in nomenclature, but corrects references to many illustrations in the main text. It adds references that have appeared since 1940, and provides supplementary keys which take into consideration recent taxonomic reviews.

The inclusion of the detailed changes, made necessary by the appearance of the recent monumental floras of the Northeastern United States, will make this much more convenient to use.

On the jacket of this manual is given a formal definition of an aquatic plant, but Dr. Fassett's real definition was "one that appears in my book." This nicely expresses both the importance of this, the outstanding treatment of the aquatic plants of North America, and something of Dr. Fassett's pleasant sense of humor.—W. H. Drury, Jr., LINCOLN, MASS.

[1] A Manual of Aquatic Plants, by Norman C. Fassett, with revision appendix by Eugene C. Ogden. The University of Wisconsin Press, Madison, Wisconsin, 1957; ix plus 405 pp. at $6.50.

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A NEW INTERGENERIC NATURAL HYBRID INVOLVING ORYZOPSIS AND STIPA (GRAMINEAE)

William A. Weber[1]

Natural hybridization on the generic level, involving the widely-distributed *Oryzopsis hymenoides* (Roem. & Schult.) Ricker of western United States and various species of *Stipa* with which it comes into contact over its range, is an established fact although the phenomenon is evidently extremely rare. In only one instance has the hybrid been detected in nature and recognized as such; the analysis of Johnson and Rogler (1943) of a putative hybrid from the Badlands of North Dakota showed the plant to be a sterile 65-chromosome offspring of a cross between the 82-chromosome *Stipa viridula* and the 48-chromosome *Oryzopsis hymenoides.* These authors showed that *Oryzopsis caduca* Beal could be identified with the hybrids under analysis, and they proposed the name × *Stiporyzopsis* for the hybrid combination *Stipa* × *Oryzopsis,* giving the name × *Stiporyzopsis caduca* (Beal) Johnson & Rogler to the combination *Stipa viridula* × *Oryzopsis hymenoides.*

Later, Johnson (1945) followed this work with a survey of herbarium specimens in the major American collections and demonstrated that similar hybrids reposed therein under various names in *Stipa* and *Oryzopsis.* In each instance, the *Oryzopsis* parent was undoubtedly *O. hymenoides;* the *Stipa* parent was inferred by the geographic location of the hybrid and by extra-

[1] University of Colorado Museum, Boulder.

polation of the *Stipa*-like characteristics of the hybrid to the appropriate *Stipa* species. Hybrid combinations were shown to exist between *Oryzopsis hymenoides* and six species of *Stipa*. For the new hybrids Johnson abandoned the practice of describing them under × *Stiporyzopsis* and indicated their hybrid status by connecting the two species names with an ×.

In June, 1957, the present writer discovered a single plant of a *Stipa-Oryzopsis* hybrid in nature on outcrops of the Pierre (Cretaceous) shales 6 miles north of Boulder, Colorado. This hybrid presents a combination of species not previously reported, and the fact that the hybrid nature of the plant was suspected at the time of discovery makes possible some observations of behavior which might otherwise have been overlooked.

The Pierre shales form a series of low hogbacks abutting against the first foothills of the Rocky Mountains north of Boulder; they are more arid than the surrounding mesas and plains and support good stands of *Oryzopsis hymenoides* and several species of *Stipa,* including *S. comata* Trin. & Rupr., *S. neomexicana* (Thurb.) Scribn., *S. robusta* Vasey & Scribn., *S. scribneri* Vasey (very rare), and *S. viridula* Trin. This list of *Stipa* species points up the importance of field recognition of the hybrids and accurate observation of the ecological situation *in situ,* especially since extrapolation of characters for determination of the *Stipa* parent would be quite difficult considering the large number of possibilities.

A single plant of the hybrid intermediate was detected in a large pure stand of *Stipa neomexicana* on the relatively gentle southeast-facing slope of a low hogback. The nearest specimens of any other species were more than 100 feet away; *S. comata* became common and intermingled with *S. neomexicana* several hundred feet to the north on more disturbed sites; *S. robusta* and *S. viridula* were roadside plants a greater distance away. A few clumps of *Oryzopsis hymenoides* were scattered through the *S. neomexicana* stand, but these did not form a pure stand until the slope became west-facing on the steeper side of the hogback some five or ten feet upslope. On the west face of the hogback the *Stipa* largely disappeared and was replaced by a good stand of *Oryzopsis.* The hybrid individual is well-established, forming a clump at least eight inches in diameter, and exceeds in height (the

PLATE 1230. *Oryzopsis* × *Stipa* hybrid. Left to right, *Oryzopsis hymenoides, Oryzopsis hymenoides* × *Stipa neomexicana, Stipa neomexicana* (scale shows 10 cm.).

tallest culm, not yet in anthesis, is 0.9 meters) the *Stipa neomexicana* plants growing nearby.

In general aspect (Plate 1230) the plant resembles the *Stipa* parent, being tall and erect, with the panicle branches slightly more spreading than strict but certainly not divaricate as in *O. hymenoides*. However, in most technical characters the dominance of the *Oryzopsis* genotype is pronounced. The pedicels are just flexuous enough to suggest the condition in *Oryzopsis;* the awn, although geniculate as in *Stipa,* is deciduous and very short compared to the extremely elongate awn of *neomexicana*; and the plumose indument of the awn, diagnostic for *neomexicana,* is completely suppressed in the hybrid. In short, the hybrid combines the growth form of the *Stipa* parent with most of the technical characters of the *Oryzopsis* parent. By inference, the hybrid probably embodies the physiological characters of the *Stipa* parent in whose habitat it grows. In anthesis it appears to be later than either parent.

The circumstantial evidence is strong for *Stipa neomexicana* to be the seed parent of the hybrid, even though other species of *Stipa* occur in the vicinity. The intermediate is 'insulated' by a large pure colony of *neomexicana,* resembles it in habit, and appears to be of an age with the surrounding plants. Unfortunately, the hybrid does not appear to carry any trait which would be absolutely diagnostic of a specific *Stipa* species. In fact, if one reviews the case histories of the various hybrids known, it is strikingly evident that the hybrid individuals are exceedingly similar regardless of the *Stipa* parentage. It is as if the *Oryzopsis* genotype quite uniformly suppressed whatever diversity of awn length, glume length, etc., would be expected to modify the various F_1 phenotypes in the direction of the *Stipa* parent.

The characteristics of the parental species and of the hybrid are outlined below. Because the *Stipa* and *Oryzopsis* plants were in the 'soft dough', and 'milk' stage, respectively, observations on their anthers and pollen were not possible. The inflorescences of the intermediate had not yet opened to discharge pollen, and the pollen was tested with iodine and examined microscopically; nothing but empty pollen with negative starch-reaction was found.

TABLE I. Morphological characters of parental species and hybrid

Character	*Oryzopsis hymenoides*	*Stipa neomexicana*	*hybrid*
Panicle	divaricate	strict	narrow, slightly spreading
Pedicels	flexuous	straight	slightly flexuous
Branchlets	10-16 spikelets	1-4 spikelets	10-16 spikelets
Glumes	ovate 8 x 2.5 mm. 3 prominent nerves	lanceolate 43 x 3.0 mm. 3 prominent and 2 short, faint nerves	lance-ovate 9 x 2.5 mm. 3 prominent nerves
Lemma	broad-fusiform	linear-fusiform	intermediate, nearer broad-fusiform
	4 x 1.5 mm. black	16 x 1.5 mm. pale brown	5.8 x 1.5 mm. pale brown
(awn)	6 mm., barbellate straight, deciduous	180 mm., plumose geniculate, persistent	16-17 mm., barbellate geniculate, deciduous
(trichomes)	3 mm. long, spreading, white, dense	0.3 mm. long, appressed, white and tawny, sparse	1.0 mm. long, appressed, white, sparse
Ligule	lanceolate 7 mm. long hyaline	truncate, ciliate 0.3 mm. long thick	lanceolate 3 mm. long hyaline
Pollen			empty, shriveled IKI negative
Anthers			red, 5.5 x 1.5 mm. sacs equal, bearded

For taxonomic purposes the new hybrid is described as follows:

Oryzopsis hymenoides (Roem. & Schult.) Ricker × **Stipa neomexicana** (Thurb.) Scribn., hybr. nov.

Planta perennis usque ad 1 m. alta. Paniculae angustae rami plus minusve flexuosi 10–16-spiculas ferentes. Glumae ut in specie *Oryzopsis hymenoides* sed paulo elongatiores. Lemmata lato-fusiformia 5.8 × 1.5 mm. brunnescentia arista barbellata decidua geniculata 16–17 mm. longa pili adpressi 1.0 mm. longi sparsi. Pollina vacua collapsa jodo non-reagentia. Antherae rubrae 5.5 × 1.5 mm. loculi aequales barbati. Ligulae lanceolatae hyalinae 3.0 mm. longae.

COLORADO. BOULDER CO.: on hogback of Pierre Shales, 6 mi. N.

of Boulder along Foothills Highway, 5,500 ft. alt., 26 June 1957, *W. A. Weber 10565* (COLO, GH).

It is interesting to note that the hybrids reported by Johnson included some in which the *Stipa* parent possessed a subplumose awn; in these the subplumose character showed up in the hybrid. However, in the present cross, the strongly plumose awn which is so distinctive of *Stipa neomexicana* is completely suppressed in the hybrid. Also, the present cross is the first involving a species of *Stipa* possessing the extremely long awn type characteristic of such species as *S. comata* and *S. spartea*. If the awn phenotype is a reliable indicator of genotypic divergence in *Stipa*, the present cross may be considered the widest of all those known to date.

In conclusion, one is led to ask the question: If these hybrids, which involve so many species of *Stipa*, occur at all, why are they not more frequent? Certainly there are thousands of places where the species overlap and where the possibility of hybridization exists. Yet the rarity of hybrids in this group must be a reality in view of the great number of grass collectors who have had the opportunity to observe them, and their failure to uncover more than a handful of specimens over a period of about one hundred years. It is to be hoped that future investigators will turn to the problem of the reasons for failure of hybrid zygotes (or whatever stage of development may be critical) to complete their development to form first generation hybrids in nature.

Literature Cited

Johnson, B. Lennart, and George A. Rogler. 1943. A cytotaxonomic study of an intergeneric hybrid between *Oryzopsis hymenoides* and *Stipa viridula*. Amer. Journ. Bot. **30**: 49–56.

Johnson, B. Lennart. 1945. Natural hybrids between *Oryzopsis hymenoides* and several species of *Stipa* Op. cit. **32**: 599–608.

A NEW CRUCIFEROUS WEED, CALEPINA IRREGULARIS, IN VIRGINIA

S. F. Blake

In March 1955 Miss Jennie S. Jones, seed analyst supervisor of the Division of Plant Industry, Virginia Department of Agriculture and Immigration, at Richmond, sent me for identification a fresh specimen of a flowering crucifer which had appeared that spring on the farm of L. Wesley Southworth at Kidds Fork, Caroline County, in central eastern Virginia, between Washington and Richmond. It proved to be *Calepina irregularis* (Asso) Thell. (often called *C. corvini* (All.) Desv.), a Mediterranean and Near East species which apparently has not before been found growing in either North or South America. Good fruiting specimens were collected about a month later.

The plant was widely scattered over an alfalfa field two and one-half acres in extent. Since the initial discovery the infestation has been reduced to a fraction of the original by hand rogueing and planting to a row crop, but the weed has spread to a slight extent into an adjacent field. In February 1957 all plants visible in both fields were removed by hand by a crew from the Department of Agriculture and Immigration, but in April specimens were still to be found, and some were collected for distribution to herbaria. In April the plant was also found in an alfalfa field about 3 miles away on the farm of J. R. Southworth, brother of L. W. Southworth. It has been learned that the same hay baler was used on the two farms, and it is supposed that the seed was transported in this way. A rather careful survey of that part of Caroline County has disclosed no other infestations.

The method of introduction of this species is not known. No fruits of *Calepina* were found in the samples representing the alfalfa seed planted by Mr. Southworth (which came from Kansas), and, in fact, no *Calepina* fruits have ever been found in seeds tested at Richmond. However, Mrs. Grace Cole Fleischman of Los Angeles, senior seed analyst of the Department of Agriculture of California, has found the seeds, or rather the indehiscent fruits, in samples of *Phalaris canariensis* imported from Morocco and Turkey. She writes me that during the '40's

and early '50's *Calepina* fruits were found, sometimes in considerable amount, in practically every one of a number of samples of Canary grass seed shipped from the countries mentioned. During the last 5 years she has handled fewer shipments and they have all been clean. Recently, however, she found one fruit of it in a sample of oats from Argentina. She knows of no record of the plant having been found growing on the Pacific Coast. Dr. A. L. Cabrera of La Plata writes me that he has no record of the occurrence of the species in Argentina.

The distribution of *Calepina*, as given in considerable detail by Thellung (in Hegi, Illustrierte Flora von Mittel-Europa **4:** 191. [1916]), and as summarized by Lawalrée (Flore générale de Belgique **2:** 202. 1956), is of considerable interest. It was originally native in the steppes north of the Caspian Sea and has been naturalized for several centuries in the Mediterranean region of Europe, later extending north into France, Belgium, Germany, Hungary, and Rumania, and occurring as an adventive plant in Great Britain, Netherlands, and Luxembourg. It is found in Algeria and as far east as Iran. It was recorded from Italy in the herbals of the 16th century, reached Paris about 1725, Belgium and Germany during the 19th century, and is apparently not spreading any farther north. O. E. Schulz in Das Pflanzenreich (IV, 105 (Heft 70): 225-227. 1919) brings together the lengthy synonymy and describes 4 unimportant forms, including one with rosy petals. The Virginia plant belongs to forma *major* F. Zimmermann, characterized by germinating in summer, overwintering as a rosette, and flowering the following spring, with thicker root (3–5 mm.), stems up to 50 cm. high, and many-flowered raceme. There are good figures of the species in Lawalrée (l.c. p. 201) and Hegi (pl. 129, fig. 3), and more than 20 other illustrations are cited in the Index Londinensis, mostly from German, French, and Italian floras.

The plant is recognized as a weed in the Old World, but apparently is not considered of much importance, and very little information about it is available. It is given in the floras of France and Germany but has attracted no attention as a weed in those countries, and is not listed in the comprehensive 4-volume work on the weeds of Russia by B. A. Keller and others (Sornye Rasteniia SSSR. 1934–35). It is included in the unannotated list

of the weeds of Spain by Dantín Cereceda. T. Poggi and R. Ciferri, in their work on Italian weeds (Malerbe e lotta. 3. ed. p. 160. 1952), merely mention it in a general list as moderately resistant to 2,4-D. The only specific account of it I have found is by Francesco Crescini (L'Italia agricola 67: 151–155. 1930), who discusses its occurrence in abundance in alfalfa fields near Bologna, notes that the fruits germinate best after exposure to heat and dryness on the surface of the soil, and concludes that the best way to eradicate it is to pull up the plants at intervals during the winter and early spring as they come up in a field.

Calepina is placed by Schulz in the subtribe *Raphaninae*, the fruit being regarded as morphologically 2-jointed with the lower joint completely suppressed. The following description should facilitate the recognition of the plant if it turns up elsewhere.

Annual or biennial, usually 30–50 cm. high, with many erectish stems, these few-branched above, glabrous throughout and somewhat glaucous; lowest leaves in a rosette, 15 cm. long or less, lyrate-pinnatifid, the others narrowly obovate to oblong, slightly toothed or the upper entire, sessile, sagittate-clasping; flowers small, in anthesis corymbosely crowded at apex of stems and branches, in fruit forming loose racemes, not bracted; pedicels slender, erectish, in fruit 5–12 mm. long; petals white, somewhat unequal (the 2 outer larger), 2.8 mm. long or less; fruit nut-like, indehiscent, 1-celled, 1-seeded, readily deciduous, globose-ovoid, bluntly short-pointed, 4-ribbed (2 of the ribs weaker) and reticulate, glabrous, 2.5–4 mm. long, tipped with the sessile stigma.—CROPS RESEARCH DIVISION, AGRICULTURAL RESEARCH SERVICE, U. S. DEPT. AGRICULTURE, BELTSVILLE, MD.

ORCHIDACEAE NEOTROPICALES III. DE ORCHIDACEIS INSULARUM TRINIDAD ET TOBAGO NOTULAE ADDITICIAE

Richard Evans Schultes

The work of completing an orchid flora of Trinidad and Tobago has brought to light several data worthy of consideration. The following notes complement those which were published in the first[1] paper of this series.

I acknowledge the continued and valuable help of Dr. Wilbur G. Downs and Dr. T. H. G. Aitken of the Trinidad Regional

[1] Schultes: "Orchidaceae Neotropicales I" in Bot. Mus. Leafl. Harvard Univ. 17 (1956) 179. "Orchidaceae Neotropicales II. De orchidaceis principaliter colombianis notulae" was published in Caldasia 7 (1957) 339–356.

Virus Laboratory in sending pertinent field observations and in their intensive collecting and cultivation of native orchids. I must also mention with appreciation the interest shown by Dr. G. A. C. Herklots, Principal of the Imperial College of Tropical Agriculture, in the progress of our work on the orchids of the Colony. Thanks are due my colleague, Mr. Leslie A. Garay, Assistant Curator of the University of Toronto Herbarium, for his collaboration and to Mr. Elmer W. Smith for his careful delineation of the new species of *Erythrodes* which Mr. Garay has herein published.

Coryanthes macrantha (*Hook.*) *Hooker* in Bot. Mag. (1831) t. 3102.

Trinidad: Ex. coll. E. J. S. Dudley, (flowering) December 4, 1955, *W. G. Downs & T. H. G. Aitken 72* (Herb. Ames 67906); Waller Field, November 24, 1956, *G. A. C. Herklots s.n.* (Herb. Trin. 15413, sheets 1 & 2).

Until very recently, we have not been able to report *Coryanthes macrantha* as an undoubted native element of the flora of Trinidad, as the provenience of all of the collections was designated as gardens or experimental stations (Schultes: op. cit. 182).

Downs & Aitken 72, taken from the cultivated collection of E. J. S. Dudley, Esq., is reported "presumed native," but no definite collection-locality of the cultivated material was given. In November, 1956, Herklots collected material of *Coryanthes macrantha* at Waller Field, Trinidad, and brought it to flower in January, 1957. There is now no question that this species forms a part of the native orchidaceous flora. The field notes for this collection state: "Infls. pendulous; lip crimson; petals yellow, spotted crimson; strong 'estery' scent (amyl acetate?)."

Epidendrum tipuloideum *Lindley* Fol. Orch. (1853) Epid. 32.

Epidendrum Broadwayi Ames & Schweinfurth in Bot. Mus. Leafl. Harvard Univ. 1 (1932) 5.

Trinidad: Saut d'Eau, North Coast. January 18, 1931, *W. E. Broadway 7444* (Herb. Ames 37893: TYPE of *Epidendrum Broadwayi*). Morne Bleu, April 9, 1955, *W. Downs & T. H. G. Aitken 46* (Herb. Ames 67837). Spring Hill Estate, Arima Valley. January 13, 1957, *T. H. G. Aitken sn.* (Herb. Ames 68590). **Venezuela:** Provincia de Carabobo, Campanura. Altitude 1000 ft. *Funck & Schlim 575* (Photograph of type, Herb. Ames 67855). Above Colonia Tovar. Altitude

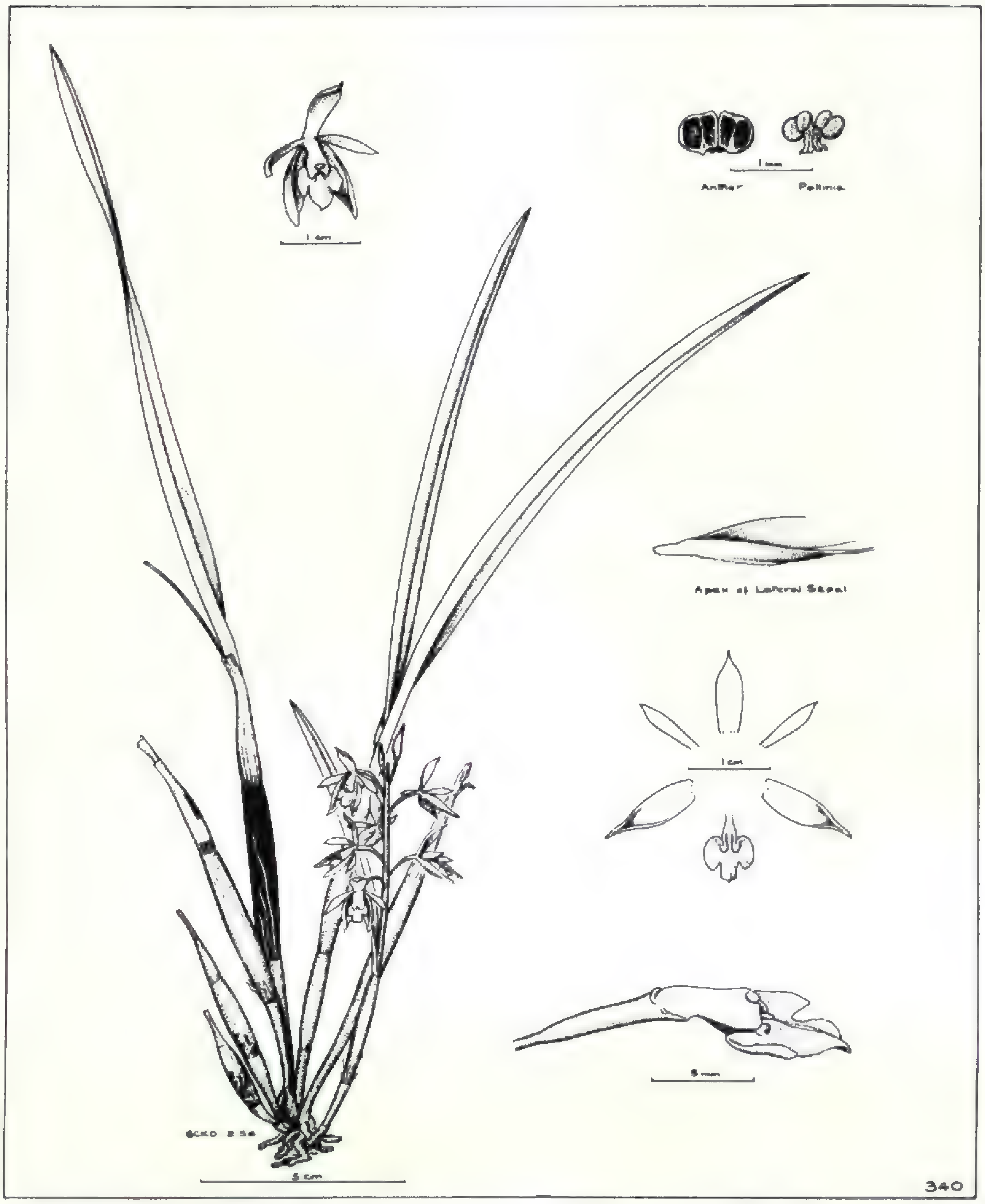
about 2000 m. Medium forest. No date. *G. C. K. Dunsterville 340* (Herb. Garay 5051).

Plant small, epiphytic, up to 17 cm. tall. Stems green, brown or purple-brown, slender, subclavate, 4–8 cm. tall, invested by close, tubular scarious sheaths, apically 1- or sometimes 2-foliate. Leaves narrowly linear, grasslike, up to 20 cm. long, 1.8 cm. wide (usually much shorter and narrower), acute; mid-nerve keeled beneath. Inflorescence racemose, much shorter than leaves, up to about 6 cm. long, basally enclosed in tubular sheath up to 3.5 cm. long, loosely 4-9-flowered. Floral bracts membranaceous, minute, lanceolate, much shorter than pedicels. Pedicel with ovary up to 1.3 cm. long. Flowers yellow or yellowish green, rather fleshy. Lateral sepals obliquely elliptic-lanceolate, basally somewhat adnate to column, 11 mm. long, 3-4 mm. wide, dorsally conspicuously carinate-mucronate at apex; dorsal sepal oblong-elliptic or oblanceolate, about 10 mm. long, 3–3.7 mm. wide, acute. Petals linear-oblanceolate, up to 9.3 mm. long, somewhat oblique, acute. Lip adnate to tip of column, 3-lobed; lamina up to 5.5 mm. long, 3.7-6.4 mm. wide (at widest part), basally 2-callose; lateral lobes semi-ovate or rounded, obtuse, marginally sometimes erose, extending about half length of lip; mid-lobe larger, broadly-triangular to irregularly subquadrate, apically acute or minutely apiculate. Column stoutish, up to 6.4 mm. long.

A comparison of the type material of *Epidendrum Broadwayi* with the description and a photograph of the type and recent collections of *E. tipuloideum* leads me to the belief that the two concepts represent one variable species.

The type of *Epidendrum tipuloideum (Funck & Schlim 575)*, which is at Kew, was collected in the Provincia de Carabobo in Venezuela. A photograph of the type (Herb. Ames 67855) shows Lindley's diagnostic sketches. Mr. Victor A. Summerhayes very kindly studied the type at my request and made a *camera lucida* drawing of the lip on the type sheet. His drawing indicates, as he states in his letter of May 12, 1955, that "the drawings on the type sheet made by Lindley are exaggerated in certain respects and give a false idea of the labellum." According to Summerhayes' drawing, the lip is trilobate and measures 5 mm. in length and 3.7 mm. in width (across the widest part); the column measures 5 mm. in length. The mid-lobe is broadly triangular (not narrowly lanceolate-triangular, as shown by Lindley) and acute; the lateral lobes are broad and rounded (not narrowly elongate and deeply indented along their margins, as shown by Lindley).

Summerhayes' notes continue: "*Epidendrum Broadwayi* appears very different at first, and we have material collected by Broadway at Maraval which seems identical. We also have, however, several sheets, all of cultivated material of Trinidad origin which differs from both of the others. The middle lobe is long and rather narrow but does not taper much until near the end, while the side lobes are more or less cruciform with no marked sinus between them and the middle lobe . . . I am won-



Epidendrum tipuloideum **Lindley. Drawing by G. C. K. Dunsterville of the collection *Dunsterville 340*.**

dering if really all these varieties (including *E. Broadwayi*) are referable to one species. After all, we know precious little about the mainland forms of the species . . . and it may be equally variable in Venezuela."

A study of the material cited above convinces me that we are, in reality, faced with a single species, the lip of which especially is extremely variable in shape. There is in the Ames Herbarium and in the Garay Herbarium a critical drawing of *Dunsterville 340* from Venezuela, which is undoubtedly referable to *Epidendrum tipuloideum* but which, in the mid-lobe of the lip, approaches *E. Broadwayi.* Furthermore, the lip in the specimen *Aitken s.n.* from Trinidad shows considerable variation in shape in different flowers from the same inflorescence.

The collection *Downs & Aitken 46,* which was erroneously assigned to *Epidendrum Rousseaueae* Schltr. (Schultes: Bot. Mus. Leafl. Harvard Univ. 17 (1956) 192, t. 49), may now be referred to *E. tipuloideum.* It has a lip which strongly resembles that of the type of *Epidendrum Broadwayi.*

Epidendrum yatapuense *Barbosa-Rodrigues* in Vellosia 1, ed. 2 (1891) 123.

Epidendrum laxum Poeppig & Endlicher Nov. Gen. ac Sp. 2 (1838) 2, *non* Swartz.

Epidendrum macrothyrsis Lehmann & Kränzlin in Engler Bot. Jahrb. 26 (1899) 472.

Recently, the name *Epidendrum laxum* Poepp. & Endl. was taken up for the concept known as *E. yatapuense* Barb.-Rodr. and *E. macrothyrsis* Lehm. & Kränzl. (Schultes: loc. cit. 190; Schweinfurth: Bot. Mus. Leafl. Harvard Univ. 17 (1956) 214).

It has been discovered that the binomial *Epidendrum laxum* is preempted by the prior publication of *E. laxum* Swartz Prodr. (1788) 125 for a concept now included in *Pleurothallis.* The next epithet, therefore, must be taken up for this wide-ranging and rather variable species: Trinidad, Peru, Ecuador, British Guiana and Amazonian Brazil (Schultes in Caldasia 7 (1957) 346).

Epistephium ellipticum *Williams & Summerhayes* in Kew Bull. (1928) 145.

Epistephium tenuifolium Mansfeld ex Hoehne Fl. Brasilica 12, 2 (1945) 42, t. 31 (*sine diagn. lat.*)

Epistephium minutum Barbosa-Rodrígues Jr. ex Hoehne loc. cit. (in synon.).

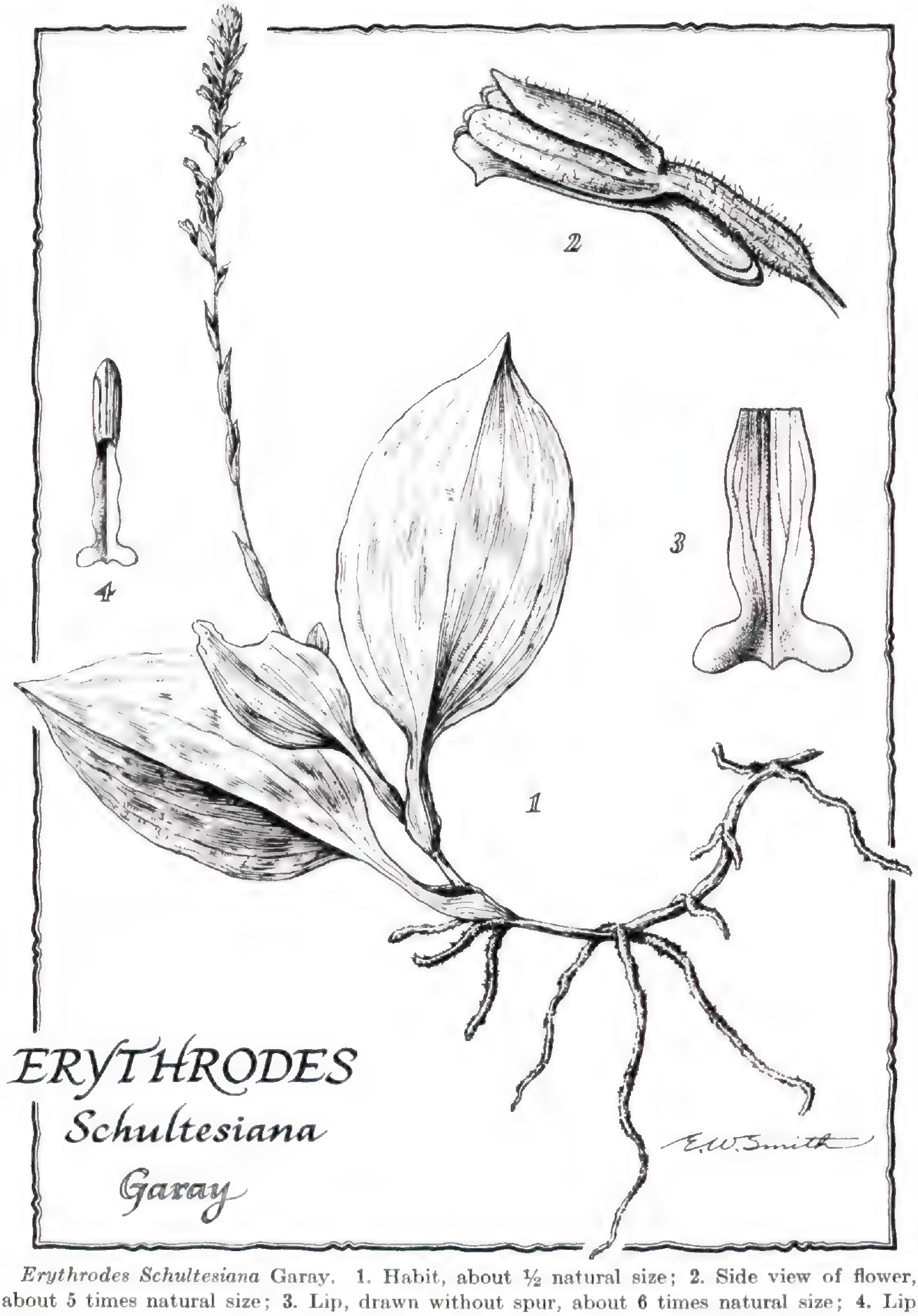
Trinidad: Valencia Road, Mora Forest end, September 1, 1925, *R. O. Williams et al s.n.* (Herb. Trin. 11324); Aripo Pool, December 26, 1927, *R. O. Williams & Cheesman s.n.* (Herb. Trin. 11903); near Aripo Pool, June 13, 1928, *R. O. Williams & G. W. Freeman s.n.* (Herb. N. Y.); Long Stretch, February 11, 1953, *N. W. Simmonds s.n.* (Herb. Trin. 14870); Long Stretch, near Gravel Pit, October 27, 1955, *N. W. Simmonds s.n.* (Herb. Trin. 15364). **Venezuela:** Estado Bolívar, Chimantá Massif. Forested west-facing slopes with sandstone boulders, between Camp 2 and Camp 3, northwestern part of Abácapa-tepuí. Altitude 850–1100 m. April 18, 1953, *Julian A. Steyermark 75115* (Herb. Ames 68525). Estado Bolívar, Chimantá Massif. Dense forest along upper reaches of Río Tirica between southeast part of Apácara-tepuí and west part of Chimantá-tepuí. Altitude 1700 m. June 24, 1953, *Julian A. Steyermark 75976* (Herb. Chicago 1,443,160).

It would seem that the invalidly published *Epistephium tenuifolium* from Pará, Brazil, represents the same concept as *E. ellipticum.* There is a slight difference in shape of the leaves. Hoehne's drawing of *Epistephium tenuifolium* shows a somewhat emarginate apex of the flattened portion of the lip, and the lip of *Epistephium ellipticum* is described as "entire." In the material and descriptions at hand, there appeared to be appreciable variability in size of the lip. All other characters, however, would seem to agree.

Erythrodes

The following notes on *Erythrodes* have been contributed by Mr. Leslie A. Garay of the University of Toronto and the National Research Council of Canada. Mr. Garay is at present spending a year at the Orchid Herbarium of Oakes Ames as a Guggenheim Fellow.

The genus *Erythrodes* encompasses about 100 different described concepts, and is distributed in the tropical and subtropical regions of both hemispheres. The majority of the species are native to the American tropics. From the Island of Trinidad only three species are known, two of which occur quite abundantly throughout the West Indies, while the third one, *E. trinitatis* Ames, a member of the "querceticola" complex, is endemic and very rare. The new species described here was discovered among the thousands of yet unidentified specimens in the Reichenbach Herbarium in Vienna.



Erythrodes Schultesiana Garay. 1. Habit, about ½ natural size; 2. Side view of flower, about 5 times natural size; 3. Lip, drawn without spur, about 6 times natural size; 4. Lip from above, drawn with spur, about 3 times natural size. Drawn by Elmer W. Smith.

The species, known only from Trinidad, may be distinguished by the following artificial key:

A. Inflorescence with an elongated peduncle.

I. Sepals 6–8 mm. long ....*E. plantaginea* (L.) Fawc. & Rendle

II. Sepals 3–5 mm. long.
  a. Terminal portion of lip entire, lunate ....
  ....*E. hirtella* (Sw.) Fawc. & Rendle
  b. Terminal portion of lip 2-lobed, the lobes divergent ....*E. Schultesiana* Garay
B. Inflorescence with an abbreviated peduncle ....*E. trinitatis* Ames

Erythrodes Schultesiana *Garay* sp. nov.

Terrestris, circiter 30 cm. altus. Rhizomate cauliformi, decumbenti; radicibus crassiusculis, villosis; caule suberecto, 3-foliato; foliis late ovatis vel ellipticis, acutis vel subacuminatis, basi abrupte in petiolum vaginantem productis, lamina 9–10 cm. longa, 5–6 cm. lata; pedunculo cum racemo satis gracili, in specimine unico leviter arcuato, minute glanduloso-puberulo, vaginis 4 remotis, acutis obsesso, usque ad 19 cm. longo; racemo dense multifloro, cylindraceo; bracteis ovato-lanceolatis, acutis vel subacuminatis, 8–10 mm. longis; sepalo postico cum petalis conglutinato, ovato-oblongo, concavo, apice acuto vel obtuso subtiliterque ciliolato, 1-nervio, 5 mm. longo, 1.75 mm. lato; sepalis lateralibus leviter falcatis, ovato-oblongis, 1-nerviis, apice obtusis subtiliterque ciliolatis, 5 mm. longis, 1.5 mm. latis; petalis falcato-oblongis, 1-nerviis, apice obtusis et subtiliter ciliolatis, 4.5 mm. longis, 1 mm. latis; labello oblongo-ligulato, antice bilobo, lobulis divergentibus, obtusis, disco 3-nervio, glabro, 5 mm. longo; calcare oblongo-cylindrico, acuto, 3.5 mm. longo; ovario breviter pedicellato, clavato, cum pedicello 7 mm. longo.

Trinidad: Legit *Cr(ueger) 47* (Type in Herb. Reichenbach 43895; Herb. Ames 68591).

This new species differs from all known concepts of *Erythrodes* from Trinidad, in having a distinctly bilobed lip. It does not seem to be closely related to any described species, though its floral structures, especially the lip, resemble *Erythrodes xystophylla* (Rchb.f.) Ames from Venezuela. However, the two species are vegetatively very dissimilar.

The specific name is given in honour of Dr. Richard Evans Schultes of Harvard University for his contributions to botanical science, especially towards our knowledge of the orchid-flora of Trinidad and Tobago.

Maxillaria Reichenheimiana *Endres & Reichenbach fil.* in Gard. Chron. (1871) 1678.

Maxillaria pachyacron Schlechter in Fedde Repert. Sp. Nov. 9 (1911) 165.

Trinidad: Cumaca, (flowered) February 10, 1957, *Downs & Aitken 64* (Herb. Ames 67811).

The collection cited herewith represents a species which has hitherto been thought to be endemic to Costa Rica and Honduras.[2] The discovery of *Maxillaria Reichenheimiana* in Trinidad is most unexpected.

The Trinidad specimen has larger flowers and more narrowly lanceolate leaves than most of the material in the Ames Herbarium from Middle America, but there are no morphological differences of sufficient importance to separate it even to a varietal status. In Middle America, *Maxillaria Reichenheimiana* is rather variable in shape of leaf and size of flower.

Quekettia pygmaea (*Cogn.*) *Garay & R. E. Schultes* comb. nov.

Ionopsis pygmaea Cogniaux in Urban Symb. Antill. 6 (1910) 624.
Trizeuxis pygmaea (Cogn.) Schlechter in Urban loc. cit. 7 (1913) 498.

Trinidad: Caparo, March 27, 1908, *W. E. Broadway* 2251 (Herb. Ames 10644; 21048).

A critical study of this concept, the generic position of which has not hitherto been entirely clear, indicates that Cogniaux's *Ionopsis pygmaea* properly belongs in *Quekettia*. It cannot be accommodated in *Ionopsis* because the flower is not spurred. While it does not exhibit all of the characters hitherto thought to be essential to *Quekettia* (e.g., a basally excavate lip), there seems little doubt that it should be referred to this generic concept.

We cannot place this species in *Trizeuxis*, as its sepals are not deeply connate (but scarcely so). There are also discrepancies in the structure of the column and in the anther which seem to separate it from *Trizeuxis*. The only illustration of the species was recently published under the binomial *Ionopsis pygmaea* (Schultes in Bot. Mus. Leafl. Harvard Univ. 17 (1956) t. L).

Quekettia is a genus of three species distributed through eastern South America from Dutch Guiana, Brazil and Argentina. It is now registered for the first time from Trinidad. We maintain *Capanemia* Barb.-Rodr. as a genus distinct from *Quekettia*.

Xylobium palmifolium (Sw.) Bentham ex Fawcett
Fl. Pl. Jam. (1893) 39.

Trinidad: Saut d'Eau, North Coast, August 1930, *W. E. Broadway* *7435* (Herb. Ames 36525).

[2] Downs, W. G., in Bull. Am. Orch. Soc. **26** (1957) 686.

Xylobium palmifolum, a West Indian species, has hitherto been known from Trinidad apparently only from a *Bradford* collection.

PLANTS NEW TO ILLINOIS AND TO THE CHICAGO REGION.—Intensive collecting in the Milwaukee Road classification yard at Bensenville, Cook County, Illinois during August, 1956 resulted in the discovery of the following new Illinois or Chicago region plant records. All specimens are on file in the Illinois herbarium of the Chicago Natural History Museum.

1. NEW TO ILLINOIS

Artemisia frigida Willd. August 8, 1956, *Thieret 2205.*
the most common *Artemisia* in the yard, about 30 plants seen.

Senecio viscosus L. August 8, 1956, *Thieret 2233.*
two colonies, with 8 and 13 plants.

Chenopodium rubrum L. August 8, 1956, *Thieret 2260.*
a group of fifteen plants, growing with *Chenopodium glaucum* and *Atriplex argentea.*

2. NEW TO THE CHICAGO REGION

Lepidium perfoliatum L. August 9, 1956, *Thieret 2291.*
scattered plants throughout the yard.

Artemisia absinthium L. August 8, 1956, *Thieret 2198.*
3 plants seen, each in a different area of the yard.—JOHN W. THIERET, CHICAGO NATURAL HISTORY MUSEUM.

A NEW VARIETY OF RUDBECKIA CALIFORNICA.—**Rudbeckia californica** Gray var. **intermedia** var. nov. Folia glabra et glauca, ovata vel anguste elliptica, margine grosse crenato, serrato, vel basi lobato.

Leaves glabrous and glaucous, ovate to narrowly-elliptical, apex acute or acuminate, base acute or rounded; the margins very irregular, coarsely crenate, dentate, or serrate, or irregularly lobed near the base, rarely almost entire; blades of the basal leaves mostly 1.5–2 dm. long; heads mostly 1 per stem; involucral bracts ciliate, glabrous and glaucous; disk globose or globose-conical, 1.5–2.5 (–3.5) cm. high, up to 1.4 cm. wide.

Type: Mt. Eddy, Siskiyou Co., California, *L. E. Smith 557*, September 1, 1913. Type in the Gray Herbarium, isotype in the U. S. National Herbarium.

Distribution: Klamath Mts., northern California, at altitudes of 3500 to 5000 feet.

The broader leaves with toothed or lobed margins readily distinguish the new variety from its nearest relative, *R. califor-*

nica var. *glauca* Blake, a narrow-leaved plant with entire leaf margins which occupies a disjunct area in northwestern California and adjacent Oregon. The glabrous leaves of var. *intermedia* clearly distinguish this variety from the conspicuously pubescent *R. californica* var. *californica* of the Sierra Nevada.—Robert E. Perdue, Jr., u. s. department of agriculture, agricultural research service, crops research division, beltsville, md.

A Posthumous Edition.[1]—It is fortunate that the flora of Wisconsin is sufficiently similar to that of New England, so that this book is useful locally. It is just the sort of small publication that is most urgently needed for the use of plant taxonomists teaching courses in New England, or amateurs of all levels of competence. Here is a book that will introduce students and advanced amateurs to the plants they meet around them, without bringing in the welter of extra-limital plants which cause confusion in large manuals.

The book has a large number of botanically accurate line-drawn illustrations, which greatly simplify the problem of identification. The accuracy of the illustrations is a rather unique feature in such a small publication.

This book should be available to all students taking a taxonomy course. It serves as a very fine introduction to the important study and fine hobby of botanizing, and it shames those of us in New England who should have prepared such a book for our own area.—W. H. Drury, Jr., lincoln, mass.

A NEW FLORA OF GREENLAND[2]

While waiting for the completion of the very slowly published North American Flora, several manuals of small parts of this continent have been worked out and published in recent years. Some are scientific floras of little interest to the non-specialist ranging up to the high quality characterizing the Flora of Alaska and Yukon by Hultén. Others are of the more popular type where scientific exactness is left out for the sake of simplicity. Only a few of the recent floras are, however, of the combined scientific and popular kind which can be used by amateurs and specialists alike and encourage an interest in botany more than other media are able to do. The Gray's Manual is of this type, and also the much too voluminous and expensive new Britton and Brown, but other regions not covered by these works still are waiting for a handy manual. Especially the arctic and subarctic parts of the con-

[1] *The Spring Flora of Wisconsin* by Norman C. Fassett, The University of Wisconsin Press, Madison, Wisconsin, 1957. v plus 189 pp.; price $2.50.

[2] Tyge W. Böcher, Kjeld Holmen, Knud Jakobsen: Grönlands Flora. Med illustrationer af Ingeborg Frederiksen. P. Haase & Söns Forlag, Köbenhavn, 1957. 313 pp.

tinent are helpless in this respect, since the scientific manuals of Polunin, Porsild, and the Danish botanists working in Greenland are useful only to the specialist.[1] The amateurs and occasional travellers, being much more numerous than the taxonomists and plant geographers, would be able to help considerably more in botanical exploration if such good and simple manuals were only available to them.

This is an appropriate occasion to welcome one such scientific and popular flora of an area of this continent perhaps better known botanically than the more heavily populated regions, despite its northern and isolated situation. One of the most-renowned specialists on the flora and vegetation of Greenland, Professor Tyge W. Böcher of Copenhagen, and two of his most able students, Kjeld Holmen and Knud Jakobsen, have put together the results of past explorations of Greenland in a very exemplary flora written in a popular style without losing scientific clarity. To add to the already high quality of the text, they had the assistance of Miss Ingeborg Frederiksen, an excellent botanical artist, to make informative and clear drawings of many of the critical taxa, some in color.

The Greenland flora is a textbook of botany on a small scale, since its first twenty pages give a concise review of the morphology of the plants to aid in understanding the descriptions. There is also information on the life-forms and distribution of the plants, the floristic provinces of Greenland, and the plant associations. Most of the book, however, is devoted to a detailed description of the almost 600 higher plants known to occur in Greenland, with particular information on their distribution inside the country and a sketchy mention of their range outside the region.

The general disposition of the Greenland flora is very much like the conventional European manuals. Every family can be determined by aid of a good general key, and it is also described briefly in its appropriate place. If a family includes more than a single genus in Greenland, a concise key makes it easy to separate these genera. Many genera are represented by one species only, but where more are present, the genus as a whole gets a short general description followed by a short key to the species. Every species is then described in fairly great detail in some few to a dozen lines, followed by the information on its distribution. If intraspecific variations are known from Greenland, these are mentioned, and so also are hybrids when occurring in the area. The nomenclature used is highly modern and synonyms are included whenever necessary.

In most cases the species concept is modern and narrow and clearly affected by the experimental works by the authors and other Scandinavians, and the generic delimitations are also highly critical. Thus, the genus *Torularia* is included in *Braya* on the basis of recent results from experiments, while *Harrimanella* is separated from *Cassiope* on similar

[1] This was written before the publication of the new Illustrated Flora of the Canadian Arctic Archipelago by A. E. Porsild, Nat. Mus. Canada Bull. 146. 1957.

evidence. But the consistency in the species concept is somewhat dim in places. For instance, *Epilobium arcticum* is separated from *E. davuricum, Saxifraga hyperborea* from *S. rivularis, S. tenuis* from *S. nivalis, Empetrum hermaphroditum* from *E. nigrum,* and *Stellaria longipes* is divided into six species. At the same time, *Saxifraga rosacea* is regarded as a subspecies only of *S. caespitosa, Myriophyllum exalbescens* is listed as a subspecies of *M. spicatum,* and *Salix callicarpaea* is given as a subspecies of *S. glauca.* Also, *Oxycoccus microcarpus* here is a subspecies of *O. quadripetalus, Vaccinium microphyllum* is taken as only a subspecies of *V. uliginosum,* and *Leucorchis straminea* is regarded as only a variety of *L. albida.* These are but a few examples of the inconsistency in species concept met with in the flora, but although this will not aid the user of the manual to get a clear concept of the species of the taxonomists, it does not decrease the usefulness of the book in any way since clear synonymy is always given and the names of intraspecific variations are included.

There is, however, one fact which considerably decreases the usefulness of this scientific and popular flora, perhaps the best available for any region in North America. Because most of the species—with the exception of the thirty-odd Greenland endemics—are also met with in the Canadian Eastern Arctic, the flora would have been very useful here, had it not been written in Danish. The excuse for this is mentioned in the foreword: it is intended mainly for the school-children in Greenland, the Danish ones as well as the Eskimos, although the latter will have to read it in a language perhaps more foreign to them than Danish is to an American. To simplify the reading for the Eskimos, there is one page written in their language and also a few plant names. And a one-page English guide and translation of the names of the floristic provinces and the frequency information is supposed to be enough to make the book useful also to English-speaking botanists. Certainly, plant geographers without knowledge of Danish will be able to get useful information from the book because of these translations, but had only the keys also been translated into English, the book would have become useful to all English-speaking travellers in Greenland and the Canadian Eastern Arctic. It is to be hoped that the authors will find it possible to translate their flora into English very soon, since it is without doubt the most valuable manual of arctic plants available to the western world.

The new Greenland flora, though not in English, is one of the books no botanist interested in the arctic regions can afford to be without. It certainly stands in the highest class of American botanical manuals and is a very worthy monument of the exemplary Danish exploration of Greenland which still is to be repeated elsewhere in the North American Arctic.—ÁSKELL LÖVE, INSTITUT BOTANIQUE DE L'UNIVERSITÉ DE MONTRÉAL, 4101 EST, RUE SHERBROOKE, MONTRÉAL 36.

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THE NEW ENGLAND BOTANICAL CLUB

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SYNOPSIS OF RUDBECKIA SUBGENUS RUDBECKIA[1]

ROBERT E. PERDUE, JR.

Rudbeckia subgenus *Rudbeckia* includes those species in which the achenes are equably quadrangular with flat or convex walls that are completely filled and commonly expanded by the mature ovule. The achenes are typically truncate at the base and basally attached to the receptacle. The pales (chaff of the receptacle) are characteristically one and one-half to two times as long as the mature achenes. The group includes annual, biennial, and perennial plants.

This subgenus is essentially a group of eastern North American species. With the exception of the very weedy and widespread *R. hirta* var. *pulcherrima,* collections from beyond the eastern borders of the Great Plains are very rare. With the exception of *R. fulgida, R. hirta,* and *R. triloba,* the species occupy fairly limited geographic areas. *R. graminifolia* is apparently endemic to western Florida, records being available from but four counties.

The species of subgenus *Rudbeckia* are very distinct. No plants have been observed in the herbarium or during the course of extensive field study that offer even the most remote suggestion of interspecific hybridization. In nature the occurrence of colonies of two or more species within close proximity has been the rule rather than the exception.

The synonymy listed for the taxa is not necessarily complete; however, all important synonyms including names used in all of the floristic manuals have been included. Names of taxa below the rank of variety have been excluded. Most of these are included in the latest edition of Gray's Manual.

[1] The research upon which this paper is based was initiated while the writer was a member of the staff of the Texas Research Foundation, Renner, Texas.

A detailed discussion of the morphological and cytological bases for the separation of *Rudbeckia* into two well defined subgenera will be presented in a forthcoming paper.

KEY TO THE SPECIES OF RUDBECKIA SUBGENUS RUDBECKIA

a. Leaves lanceolate (rarely broadly linear) or wider, never more than 6 times as long as broad, venation obviously pinnate; pales rounded to acute or cuspidate, never mucronate; rays usually yellow, occasionally brownish-red at the base.

b. Style tips elongate, slenderly subulate .... 1. *R. hirta.*

b. Style tips short and blunt.

c. Pales rounded, obtuse, or merely acute.

d. Pales glabrous or rarely pilose with a few loose white hairs near the apex, apex entire, ciliate, or erose; leaves never glandular.

e. Plants never stoloniferous, the leafy tufts arising only at the base of the stem; basal leaves broadly linear to lance-spatulate; stems and leaves densely villous-hirsute, branches sharply ascending .... 2. *R. missouriensis.*

e. Plants commonly stoloniferous, most of the leafy tufts arising at the ends of the stolons; basal leaves lanceolate or broader; stem and leaves nearly glabrous, hirsute, or strigose (villous-hirsute only in var. *deamii*); branches distinctly spreading .... 3. *R. fulgida.*

d. Pales canescent near the apex with short viscidulous hairs; leaves commonly glandular as evidenced by the presence of minute globules of clear brownish exudate (leaves non-glandular in *R. mollis* in which species stem is densely pilose near the base).

f. Leaves entire or coarsely toothed, never deeply lobed.

g. Stem densely pilose below; basal leaves spathulate and sessile or with broadly winged petioles; plant annual .... 4. *R. mollis.*

g. Stem glabrous below or with a few coarse hairs; basal leaves broadly elliptical or ovate, borne on long slender petioles; plant perennial.

h. Achene crownless or crown, when present, very obscure; heads 4-8; rays spreading. 5. *R. heliopsidis.*

h. Crown of the achene conspicuous; head usually solitary; rays reflexed .... 6. *R. grandiflora.*

f. At least some of the leaves deeply 3(–5)-lobed 7. *R. subtomentosa.*

c. Pales acuminate-cuspidate .... 8. *R. triloba.*

a. Leaves narrowly linear, grass-like, at least 10 times as long as broad, veins apparently parallel; pales mucronate; rays deep reddish-brown to orange red .... 9. *R. graminifolia.*

1. **Rudbeckia hirta** L. This is a complex species but hardly so confusing as would be suggested by the abundance of names that have been assigned to its variants. There are numerous local variants and minor forms that are unworthy of recognition. Within the species, however, five fairly well defined geographic variants can be recognized as outlined below, although where ranges overlap there is often great morphological intergradation between varieties.

KEY TO THE VARIETIES OF R. HIRTA

a. Stem branching above the middle (if simple, the peduncle not more than 1/3 as long as the height of the plant), the branches ascending; plant of wide distribution.

b. Leaves coarsely toothed, basal leaves broadly elliptical to oval, 2.5-7.0 cm. wide, blades mostly twice as long as wide, cauline leaves ovate-lanceolate or ovate, the sessile ones commonly pandurate, plant mostly of Appalachian Highlands (Pennsylvania to Georgia and Alabama; sparingly north to Maine, west to Illinois) ....1a. var. *hirta*.

b. Leaves entire or finely serrate, basal leaves narrowly to broadly oblanceolate or lanceolate, 1–2.5(–5) cm. wide, blade (3–)4–5 times as long as wide, cauline leaves spatulate, oblanceolate or broadly linear.

c. Stem simple or branching near the middle, peduncles at least 7 cm. long, 1/5–1/3 as long as the total height of the plant (Newfoundland to British Columbia, south to Florida and northern Mexico; apparently rare west of the Rocky Mts.) ....1b. var. *pulcherrima*.

c. Stem branching near the apex, peduncles 1–6 cm. long, never more than 1/7 as long as the total height of the plant (Virginia coastal plain) ....1c. var. *corymbifera*.

a. Stem branching at and below the middle (if simple, the peduncle at least ½ as long as the height of the plant), the branches divergent; plant of the lower Gulf Coastal Plain from Florida to southern Texas.

d. Stem branching at or near the middle, rarely at the base, never scapose; leaves mostly pale green (to brownish when dry), hispid to somewhat sericeous, rough but never extremely harsh to the touch, basal leaves narrowly to broadly oblanceolate (coastal plain, southern Georgia to Florida, west to southern Texas) ....1d. var. *angustifolia*.

d. Stem branching at or near the base, often scapose; leaves mostly dark green, scabrous or hirsute, very harsh to the touch, basal leaves broadly obovate or nearly orbicular to broadly oblanceolate (central and southern Florida) ....1e. var. *floridana*.

1a. **R. hirta** L. var. **hirta** (*R. hirta* L., Sp. Pl. **2:** 907. 1753; *R. brittonii* Small, Mem. Torr. Bot. Club **4:** 130. 1894; *R. hirta* var. *brittonii* (Small) Fern., Rhodora **39:** 457. 1937; *R. amplectens* T. V. Moore, Pittonia **4:** 177. 1900; *R. monticola* Small, Torreya **1:** 67. 1901; *R. hirta* var. *monticola* (Small) Fern., Rhodora **39:** 457. 1937.).

1b. **R. hirta** L. var. **pulcherrima** Farwell, Rep. Mich. Acad. Sci. **6:** 209. 1904 (*R. serotina* Nutt., Jour. Acad. Nat. Sci. Phila. **7:** 80. 1834; *R. bicolor* Nutt., Jour. Acad. Nat. Sci. Phila. **7:** 81. 1834; *R. strigosa* Nutt., Trans. Am. Phil. Soc. N. S. **7:** 354. 1840; *R. lanceolata* Bisch., Del. Sem. Hort. Heidelb. 4. 1848, ex Walp. Ann. **2:** 855. 1852; *R. serotina* Nutt. var. *lanceolata* (Bisch.) Fern. & Schub., Rhodora **50:** 175. 1948; *R. flexuosa* T. V. Moore, Pittonia **4:** 180. 1900; *R. flava* T. V. Moore, Pittonia **4:** 179. 1900; *R. longipes* T. V. Moore, Pittonia **4:** 178. 1900; *R. sericea* T. V. Moore, Pittonia **4:** 178. 1900; *R. hirta var. sericea* (T. V. Moore) Fern., Rhodora **39:** 457. 1937; *R. serotina* var. *sericea* (T. V. Moore) Fern. & Schub., Rhodora **50:** 175. 1948; *R. flava* T. V. Moore var. *perbracteata* Lunell, Am. Mid. Nat. **2:** 157. 1912.). This widespread weed was regarded as a distinct species (*R. serotina* Nutt.) in the latest edition of Gray's Manual. Recognition of this taxon as a variety of *R. hirta* necessitates the adoption of Farwell's name, the first legitimate name in varietal rank.

1c. **R. hirta** L. var. **corymbifera** Fern., Rhodora **39:** 457. 1937. (*R. serotina* var. *corymbifera* (Fern.) Fern. & Schub., Rhodora **50:** 175. 1948.).

1d. **R. hirta** L. var. **angustifolia** (T. V. Moore), comb. nov. (*R. floridana* var. *angustifolia* T. V. Moore, Pittonia **4:** 176. 1900; *R. divergens* T. V. Moore, Pittonia **4:** 177. 1900.). This taxon has become fairly well known under the name *R. divergens* T. V. Moore. Use of the less appropriate name, as adopted above is required when this entity is placed in its proper position as a variety of *R. hirta*.

1e. **R. hirta** L. var. **floridana** (T. V. Moore), comb. nov. (*R. floridana* T. V. Moore, Pittonia **4:** 176. 1900.).

2. **Rudbeckia missouriensis** Engelm. ex Boynt. & Beadle, Biltmore Bot. Stud. **1:** 17. 1901. (*R. fulgida* Ait. var. *missouriensis* (Engelm.) Cronquist, Rhodora **47:** 401. 1945.). East-central Missouri to northwestern Arkansas; southwestern Arkansas and southeastern Oklahoma; southeastern Texas.

3. **Rudbeckia fulgida** Ait. This is one of the most complex species of subgenus *Rudbeckia*. Most of the varieties occupy fairly definite geographic ranges but there is great overlap in their distribution and morphological intergradation is considerable. The following varieties are recognized:

KEY TO THE VARIETIES OF R. FULGIDA

a. Basal leaves narrowly elliptical, narrowly lanceolate, or narrowly oblanceolate, the blades 1/3 as broad as long (Pennsylvania to Illinois, south to Florida and Louisiana) 3a. var. *fulgida*.

a. Basal leaves broadly elliptical to ovate or nearly orbicular, 1/2 to 2/3 as broad as long.

b. Cauline leaves scarcely reduced in length up the stem, those at and just below the first branch nearly or quite as large as the lower.

c. Stem and leaves densely and retrorsely villous-hirsute, basal leaves coarsely crenate, rarely coarsely serrate, cauline leaves sharply serrate, the teeth usually small and remote (Ohio, Indiana, and Illinois)........3b. var. *deamii.*

c. Stem moderately villous-hirsute, leaves scabrous or strigose, basal leaves entire or obscurely crenate, cauline leaves coarsely serrate, commonly lacerate (Connecticut to Illinois, south to West Virginia) 3c. var. *speciosa.*

b. Cauline leaves diminishing in size gradually up the stem, the uppermost commonly reduced to the proportions of large bracts.

d. Apex of the pales eciliate; rays 2.5–4 cm. long (Michigan, Ohio, and Indiana) ....3d. var. *sullivantii.*

d. Apex of the pales prominently ciliate; rays 1–3 cm. long.

e. Leaves narrowly to broadly ovate, the base usually cordate, occasionally broadly rounded, sparingly pilose on both surfaces (Ohio, south to Alabama and Georgia) ....3e. var. *umbrosa*

e. Leaves elliptical, ovate, or orbicular; the base acute, obtuse, rounded, or truncate, never cordate; leaves minutely strigose or scabridulous.

f. Cauline leaves lanceolate to ovate-lanceolate; rays mostly 1.5–3 cm. long (Missouri and Arkansas to Oklahoma and Texas) ....3f. var. *palustris.*

f. Cauline leaves broadly spatulate, oblanceolate, or pandurate; rays mostly 1–1.5 cm. long (Virginia and Tennessee to northern Florida) 3g. var *spathulata.*

3a. **R. fulgida** Ait. var. **fulgida** (*R. fulgida* Ait., Hort. Kew. **3:** 251. 1789; *R. chrysomela* Michx., Fl. Bor. Am. **2:** 143. 1803; *R. truncata* Small, Bull. Torr. Bot. Club **25:** 478. 1898; *R. acuminata* Boynt. & Beadle, Fl. S. E. U. S. ed. 1, 1256. 1903; *R. foliosa* Boynt. & Beadle, Fl. S. E. U. S. ed. 1, 1256. 1903; *R. tenax* Boynt. & Beadle, Fl. S. E. U. S. ed. 1, 1257. 1903.).

3b. **R. fulgida** Ait. var. **deamii** (Blake), comb. nov. (*R. deamii* Blake, Rhodora **19:** 113. 1917.).

3c. **R. fulgida** Ait. var. **speciosa** (Wenderoth), comb. nov. (*R. speciosa* Wenderoth, Ind. Sem. Hort. Marb. 1828.).

3d. **R. fulgida** Ait. var. **sullivantii** (Boynt. & Beadle) Cronquist, Rhodora **47:** 400. 1945. (*R. sullivanti* Boynt. & Beadle, Biltmore Bot. Stud. **1:** 15. 1901; *R. speciosa* var. *sullivanti* (Boynt. & Beadle) Robinson, Rhodora **10:** 68. 1908.).

3e. **R. fulgida** Ait. var. **umbrosa** (Boynt. & Beadle), Cronquist, Rhodora **47:**400. 1945. (*R. umbrosa* Boynt. & Beadle, Biltmore Bot. Stud. **1:** 16. 1901; *R. chapmani* Boynt. & Beadle, Biltmore Bot. Stud. **1:** 14. 1901.).

3f. **R. fulgida** Ait. var. **palustris** (Eggert), comb. nov. (*R. palustris*

Eggert ex Boynt. & Beadle, Biltmore Bot. Stud. **1:** 16. 1901; *R. coryi* Shinners, Field & Lab. **17:** 59. 1949.).

3g. **R. fulgida** Ait. var. **spathulata** (Michx.), comb. nov. (*R. spathulata* Michx. Fl. Bor. Am. **2:** 144. 1803.).

4. **Rudbeckia mollis** Ell., Sketch **2:** 453. 1823. Southeastern Georgia and northeastern Florida.

5. **Rudbeckia heliopsidis** T. & G., Fl. N. Am. **2:** 310. 1842. Very local, southeastern Virginia to eastern Alabama.

6. **Rudbeckia grandiflora** (Sweet) DC.

KEY TO THE VARIETIES OF R. GRANDIFLORA

a. Leaves conspicuously pilose, the surface soft to the touch, the hairs mostly 1 mm. long or longer; lower portion of the stem distinctly pubescent (Central Arkansas, west to eastern Oklahoma, south to northeastern Texas; Georgia) 6a. var. *grandiflora*.

a. Leaves not conspicuously pubescent, either scabrous or hirsute, or rarely, nearly glabrous, the surface very rough to the touch, the hairs mostly about 0.5 mm. long; lower portion of the stem nearly glabrous (Central Arkansas to Louisiana and eastern Texas) ....6b. var. *alismaefolia*.

6a. **R. grandiflora** (Sweet) DC. var. **grandiflora** (*R. grandiflora* (Gmel.) DC., Prodromus **5:** 556. 1836; *Centrocarpha grandiflora* Sweet, Brit. Fl. Gard. (ser. 2) **1:** pl. 87. 1831. The correct author citation for this taxon has been discussed by Shinners in Field and Lab. **17:** 62–63. 1949.

6b. **R. grandiflora** (Sweet) DC. var. **alismaefolia** (T. & G.) Cronquist, Rhodora **47:** 401. 1945. (*R. alismaefolia* T. & G., Fl. N. Am. **2:** 310. 1842.).

7. **Rudbeckia subtomentosa** Pursh, Fl. Am. Sept. **2:** 575. 1814. (*R. tomentosa* Ell., Sketch **2:** 453. 1823; *R. odorata* Nutt., Jour. Acad. Phila. **7:** 78. 1834; *R. subtomentosa* Pursh var. *craigii* Sherff, Rhodora **14:** 164. 1912; *R. intermedia* McLeland, Nat. Hort. Mag. **2:** 16. 1923. Michigan to Wisconsin, southwest to Louisiana and Oklahoma.

8. **Rudbeckia triloba** L.

KEY TO THE VARIETIES OF R. TRILOBA

a. Mature disk 0.6–1.3 cm. broad; rays 0.8–1.7 cm. long.
- *b.* Stem leaves merely toothed or palmately 3-lobed (Connecticut to Michigan and Iowa, south to Texas and Georgia) ....8a. var. *triloba*.
- *b.* Stem leaves pinnately 5–7-lobed (western North Carolina and western Florida) ....8b. var. *pinnatiloba*.

a. Mature disk 1.4–2 cm. broad, rays 1.8–3 cm. long, (western North Carolina and eastern Tennessee) ....8c. var. *rupestris*.

8a. **R. triloba** L. var. **triloba** (*R. triloba* L. Sp. Pl. **2:** 907. 1753; *R. Beadlei* Small, Fl. S. E. U. S. ed. 1, 1258. 1903; *R. triloba* L. var. *Beadlei* (Small) Fern., RHODORA **39:** 458. 1937.).

8b. **R. triloba** L. var. **pinnatiloba** T. & G., Fl. N. Am. **2:** 309. 1842; (*R. triloba* L. *β pinnatiloba* T. & G., Fl. N. Am. **2:** 309. 1842; *R. pinnatiloba* (T. & G.) Beadle, Bot. Gaz. **25:** 277. 1898.).

8c. **R. triloba** L. var. **rupestris** (Chickering) Gray, Syn. Fl. N. Am. **1**(2): 260. 1884; (*R. rupestris* Chickering, Bot. Gaz. **6:** 188. 1881.).

9. **Rudbeckia graminifolia** (T. & G.) Boynt. & Beadle, Biltmore Bot. Stud. **1:** 12. 1901. (*Echinacea ? atrorubens β ? graminifolia* T. & G., Fl. N. Am. **2:** 306. 1842; *R. atrorubens* of Gray, Syn. Fl. N. Am. **1**(2): 259. 1884, not Nutt.).—U. S. DEPARTMENT OF AGRICULTURE, AGRICULTURAL RESEARCH SERVICE, CROPS RESEARCH DIVISION, BELTSVILLE, MD.

PARAFORMALDEHYDE AS A SOURCE OF FORMALDEHYDE FOR USE IN BOTANICAL COLLECTING

J. S. WOMERSLEY

SINCE 1946 the author has been using the "formalin technique" for the preparation of botanical specimens under tropical conditions. Various modifications have been made to the technique employed since first used in New Guinea.

The method as now used requires the following materials in addition to the usual equipment of a botanist engaged in collecting in tropical forests:—

(1) Newspaper or newsprint, preferably cut by guillotine to 17½" x 11½" with the fold on one of the long sides.
(2) Latticed frames, 18" x 12", constructed of 1" x ¼" dressed timber, spaced 1" apart in the lattice and nailed at all points of contact between the horizontal and vertical members.
(3) An aqueous solution containing approximately 4% formaldehyde by weight.
(4) A rectangular tank with inside measurements 18½" x 12½" and of 12" depth.
(5) Strong waterproof paper with an inner core of bituminised fibre of the brand known as "Sisalkraft" in Australia.

When collecting in the field botanical specimens are placed individually between sheets of newsprint. Pads of newsprint containing 10 to 12 sheets with fold on the left enclosed in a single folded sheet with fold on the right provide a ready means of collecting the 10–12 duplicates of each species generally secured by the author. Each packet then represents the material collected of each number. These packets are placed between a

pair of the 18″ x 12″ lattice forms which can be held together with straps or several turns of strong string. Considerable pressure can be exerted on the specimens in this way.

On return to the base camp after a day's collecting the bundles may be opened and the specimens repacked into new newspaper if desired. This is frequently necessary and is generally desirable as the specimens are "tamed" after this first pressing. Leaves, flowers and fruits may be arranged to best advantage from the point of view of the final specimen at this stage. Care should be taken when preparing this repacked bundle to use pads of folded newspaper to protect any parts of the specimen of considerable thickness, e.g. fruits, twigs etc. If done carefully the final bundle will be rectangular in shape.

The tank constructed from galvanised sheet iron and heavily painted internally with bituminous paint, is now approximately ⅓ filled with formalin containing 4% formaldehyde. These tanks which are fitted with a good lid and carrying handles make ideal transport boxes for the collecting frames, newspapers etc. The prepared bundles of specimens are then placed into the tanks, more formalin added if necessary to completely cover the bundle and a stone placed on top to ensure that the bundle of specimens remains submerged.

Specimens are left in the tanks for 18 to 24 hours, then removed, drained of free liquid and securely wrapped in "sisalkraft" waterproof paper. For transport by human porterage it is well to sew bundles into a large jute sack of the type used for shipping copra.

The bundles of specimens are then transferred to headquarters where drying facilities using artificial heat are available. Bundles of specimens treated by this technique have been kept for periods up to 3 months without deterioration.

The above technique largely follows that discussed by Schultes (1947), Fosberg (1947), and Lawrence (1951). The use of alcohol in a country such as New Guinea is not very practical in view of the strict legislation which restricts the access of the indigenous population to alcoholic liquors. However, Fosberg's claim that the alcohol increases the wetting properties of the solution may be readily met by the addition of an ounce or so of detergent to the formalin. The actual benefit of such an additive is doubtful except where the plant foliage has a decidedly

waxy epidermis. Perhaps added detergent would be beneficial in handling succulents.

The use of the tanks allows the specimens to be handled with a minimum of inconvenience from the odour of formaldehyde. In any camp the tanks provide welcome seating space even when in use.

A considerable step forward in using formalin in the tropics is claimed by the success achieved using paraformaldehyde powder as a source of formaldehyde. Cartage of liquid is thereby obviated. Hitherto this has been the greatest problem in using formaldehyde in tropical countries; apart from the weight, glass containers are easily broken and tins tend to rust allowing leaks to occur which, if the material is being carried by air, as is frequently so, can cause great inconvenience.

Paraformaldehyde, obtainable commercially as a white powder in sealed tins of convenient weight, will dissolve slowly in cold water to form a solution of formaldehyde. Rate of solution is accelerated by stirring, increase of temperature or the presence of alkali. Under controlled laboratory conditions 20 grams of paraformaldehyde powder was dissolved in 250 mls. of rain water at 64°C in the presence of hexamine, 0.4% by weight, with intermittent shaking in 15 minutes to give a solution of specific gravity 1.023 when cooled to 28.2°C.

From published data and private communications the specific gravity of formalin is approximately equal to $1.00 + \frac{3W}{1000}$ where W is equivalent to the weight per cent of formaldehyde. To facilitate ascertaining the weight per cent of formaldehyde from specific gravity readings (conveniently taken with a clinical urinometer, range 1.000 to 1.050) an easily prepared graph is used.

In practice a bucket containing 2 gallons of water is heated almost to boiling point, about an ounce of hexamine added, removed from the fire and placed in a well ventilated place. The paraformaldehyde is added gently with continuous stirring. The operator should stand on the windward side during this operation. The solution will become clear in 5 to 10 minutes and may then be transferred to the tank to cool overnight. The specific gravity of the solution should be determined when cool and should not be less than 1.012. During use the specific gravity of the solution

should be determined periodically and additional formaldehyde solution prepared and added as required.

In practice the use of formalin as a preservative allows the maximum amount of time in the field to be devoted to collecting. This is an important consideration when the collector is tied to a position which allows only limited time to be spent in the field. Certainly, if time permits, as in the major expeditions devoted only to biological collecting, specimens dried by artificial heat in the field are of excellent quality. Mention must be made of those collected by Mr. L. J. Brass of the Archbold Expeditions and Dr. R. D. Hoogland of the Commonwealth Scientific and Industrial Research Organization during field operations in New Guinea.

However, wherever time is limited the use of the formalin technique is strongly recommended. The quality of the final specimen is little impaired by comparison with the specimen dried directly. Certain advantages, namely inhibition of leaf fall and lack of blackening of the flowers of certain genera, e.g. *Mucuna* and some orchids accrue from the formalin technique. The yellow green colour of the finally dried specimen of aluminium accumulating plants, e.g. *Symplocos*, is retained. However, specimens prepared through the formalin technique are of doubtful value for investigation for pharmacologically active substances. Perhaps formalinized specimens should be so marked in herbaria.

An interesting possibility is the addition of an insecticide to the formaldehype solution which could obviate the use of mercuric chloride poisoning of the dried specimens. No experiments have yet been made but the author is giving consideration to a further improvement in the technique.

Grateful acknowledgement is made to Mr. L. J. Brass who first suggested to me the use of paraformaldehyde and who also furnished data supplied by Du Pont & Co. Inc., U.S.A., relating to the solubility of paraformaldehyde and the use of hexamine, to Mr. G. Hermon Slade of Polymer Corporation Pty. Ltd., Sydney; and to Mr. D. Murty, Senior Chemist, Department of Agriculture, Stock and Fisheries, Rabaul, for data on densities of formaldehyde solutions, and also to Mr. L. S. Smith and the late Mr. C. T. White who first introduced me to the use of formalin in the preparation of botanical specimens.

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NOTES ON SOME JAMAICAN EUGENIAS

GEORGE R. PROCTOR

THE CLASSIFICATION of Jamaican rodwoods presents many unsolved problems. Volume 5 of "Flora of Jamaica" (1926) lists 14 species of *Calyptranthes* and 37 indigenous species of *Eugenia*. Many of these are still very poorly known, and at the same time new, undescribed species are occasionally being found. The identification of specimens is made more difficult by the fact that the key in "Flora of Jamaica" is not dichotomous. Aside from the mere troublesome mechanics of identification with a polychotomous key, one also begins to wonder if some of the taxa (especially those based on few or but a single collection) represent real populations. In some cases further collecting will perhaps show that certain taxa are not specifically distinct, while others will have their distinctness clarified by additional data.

One example of clarification involves two entities occurring in the northern part of the Parish of Clarendon and adjacent areas. These are *Eugenia confusa* and *Eugenia clarendonensis*.

Eugenia confusa is widely distributed in the West Indies and also occurs in southern Florida. *E. clarendonensis* has hitherto been known from a single locality called Peckham Woods, in northern Clarendon, Jamaica. The former species, which also occurs in localities adjacent to Peckham Woods, is usually distinguished by its larger, more narrowly acuminate leaves and "racemose-umbelliform" inflorescence. *E. clarendonensis*, on the other hand, is supposed to have strictly umbelliform axillary flower-clusters. In most other details these two taxa are suspiciously similar, as shown by the following table:

	EUGENIA CONFUSA	EUGENIA CLARENDONENSIS
Plant form	Shrub or small tree	Shrub
Indument	Glabrous	Glabrous
Leaves	4–6.5 cm. long long-acuminate or sometimes acute or obtuse	2.5–4 cm. long obtuse
Midrib	Impressed	Impressed
Glandular dots	Numerous	Numerous
Upper surface	Shining	Shining
Texture	Leathery	Leathery
Petioles	4–8 mm.	3–6 mm.
Inflorescence	"Racemose-umbelliform"	Umbelliform
Flowers	Usually 3–7	1–4 (–8)
Pedicels	8–16 mm. long	10–17 mm. long
Sepals	1.5–2 mm.	1.5–2.8 mm.
Petals	"Twice as long as sepals"	4 mm. long

Eugenia confusa has subglobose fruit 5–6 mm. in diameter, but the fruits of *E. clarendonensis* have never been found at the type locality. It is clear that in the absence of differentiating fruit characters, a breakdown in the distinction based on the leaves and type of inflorescence would probably render the maintenance of *E. clarendonensis* as a species untenable.

Recently, exploration of the Mason River Savanna area of northern Clarendon (about 10 miles east of Peckham Woods at about the same elevation) has revealed a population which appears to combine the leaf-characters of *E. clarendonensis* with the inflorescence-structure of *E. confusa.* However, the fruits (many observed) are obliquely ellipsoidal and clearly distinct from the subglobose ones of *E. confusa.* It is here suggested that this population (collected as *Proctor 16479*) represents a form of *E. clarendonensis* transitional in inflorescence towards *E. confusa*, and that the shape of the fruit in this case affords a more stable basis of distinction between the two taxa than the presence or absence of a short rachis to the inflorescence. The latter character, in fact, may often be of very little significance, though it is a major key-character in "Flora of Jamaica."

In reviewing the meagre available material of *E. clarendonensis* it was necessary to consider a specimen, labelled as this species, collected in the Santa Cruz Mountains, Parish of St. Elizabeth. It was soon obvious that the material could not be equated with any other known Jamaican species, being distinguished from all those with umbelliform inflorescences by its much larger, more

numerous flowers. It is also unlike any species seen from other West Indian islands. It is therefore here proposed as new.

Eugenia perratoni Proctor, sp. nov.

Arbuscula glabra; folia elliptica vel ovato-elliptica, 4–5 cm. longa (petiolis includentibus 3–5 mm.), 2–2.5 cm. lata, apice obtusa vel rotundata subacuminata, coriacea, venis utrinque prominulis, infra cum punctis parvulis obscuris. Inflorescentia terminalis, sessilis et umbelliformis; flores 7–15, pedicellis subcrassis 7–17 mm. longis, bracteolis ovatis, circa 1 mm. longis; calycis tubus 3 mm. longus, 5-lobatus, lobis (sepalis) rotundatis, inaequalibus, 3–5 mm. longis, cum punctis glandulosis numerosis; petala 5 mm. longa, cum punctis glandulosis numerosis. Fruges invisae.

A glabrous shrub; leaves elliptic or ovate-elliptic, 4–5 cm. long (including petioles of 3–5 mm.), mostly 2–2.5 cm. broad, the apex obtuse or very bluntly acuminate, the base broadly cuneate, coriaceous, the veins prominulous on both sides and the margins thickened beneath, very obscurely gland-dotted beneath with the dots faintly pellucid. Inflorescence a sessile terminal umbel of 7–15 flowers, the stout pedicels 7–17 mm. long; bracteoles ovate, about 1 mm. long; calyx usually 5-parted, the tube about 3 mm. long and the lobes (sepals) unequal, roundish, 3–5 mm. long, all parts densely glandular-punctate; petals 5 mm. long, of firm texture and densely glandular punctate. Fruit not seen.

TYPE: *Perraton 153* (Institute of Jamaica *Sheet No. 3760*), collected at Munro College, Santa Cruz Mountains, Parish of St. Elizabeth, elev. c. 2600 ft., on June 4, 1952. The type locality is characterized as being "scrub woodland," which means rather dry second-growth woodland on a rocky limestone substratum. The collector was Christopher Perraton, then a teacher of biology at Munro College.

The writer believes that *Eugenia perratoni* is probably most closely allied to *E. polypora,* described from Dolphin Head Mountain in the Parish of Hanover. It differs from the latter species in having much smaller leaves, terminal instead of axillary inflorescences which are sessile-umbelliform instead of having a rachis, and in having larger flowers with normally 5 instead of 4 sepals. *E. polypora* is described as being a large tree whereas the type plant of *E. perratoni* was a shrub, but this is not a reliable distinction owing to the fact that the former species was collected in virgin forest, while the latter came from second-growth scrub woodland.

It is suggested that here is a relationship somewhat analogous to that between *E. confusa* and *E. clarendonensis,* as described

in the first part of the present paper, and that ultimately when the fruits of *E. perratoni* are collected they may prove similarly of more taxonomic value than the structure of the inflorescence, although there is as yet no evidence that the latter character is unstable in this case.—INSTITUTE OF JAMAICA, KINGSTON.

Analysis of Vegetative Propagation in Quercus prinoides.— In matters of pure taxonomy, the practicing systematist often overlooks the seemingly insignificant, only to find that "major or minor" characters will not always in themselves serve as criteria for taxa delimitations. An excellent example of this is to be found in the arborescent *Quercus muehlenbergii* Engelm. and its shrubby counterpart, *Quercus prinoides* Willd.

While in the past the two have never been merged as a single entity, various workers have treated them in a variety of ways. One leading manual recognizes the two as distinct on the specific level, but yet another recognizes *Q. prinoides* var. *prinoides* as the shrub, and *Q. prinoides* var. *acuminata* as the tree. As the result of field observation, one soon realizes that the sole distinction between the two is the tree vs. shrub growth habit. Marginal teeth numbers and size of the blade present such a great overlap that they can never be relied on with any certainty, although these are the characters long used by systematists in separating the two. Numerous are the herbarium sheets labeled *Q. prinoides* with leaves of great size and a corresponding larger number of teeth; and the converse is to be found on the sheets labeled *Q. muehlenbergii* with unusually small leaves and "under seven" teeth.

This paper is presented not as a taxonomic treatment of the two taxa, as the author's treatment of these two species, as well as *Q. prinus* L. and *Q. brayi* Small is to appear shortly. The purpose of the paper is rather to show the importance of vegetative propagation as a good character in the distinction of the two taxa, and to supplement the earlier work of Muller (Madroño **11:** 129–137, 1951). It may be added that this writer does not recognize the two as distinct on the specific level, and the names *Q. prinoides* and *Q. muehlenbergii* are here used merely for convenience of reference, pending the publication of the taxonomic treatment.

An excavation of a single specimen of *Q. prinoides* recently in a wooded area in Jefferson County, Kansas, revealed a most significant fact: the plant did not have a tap root as might be expected, but rather was connected by means of a rhizome to a series of aerial shoots in close proximity. This clone, naturally, was extremely uniform in leaf characters. A short distance from this clone another shrub with quite different foliage was observed, and excavation proved that it, too, was clonal, with its several aerial shoots being just as uniform in leaf characters. Shrubs of both systems had cups of last year's acorns still present.

The significance of this is important, both taxonomically and ecologically. Seedlings of *Q. muehlenbergii* never spread vegetatively, and by this seemingly insignificant character, the true shrub can always be distinguished from young trees. In addition, acorns are rarely borne until *Q. muehlenbergii* has reached small tree size, whereas *Q. prinoides* bears at extremely small sizes, usually only a foot or so high. Failure to find flowers early in the season or fruits later does not invalidate the shrub character, however, since the rhizomes of *Q. prinoides* are usually only a few centimeters below the soil surface, and can easily be discovered by scraping the soil for short distances at the base of the assumed shrub with the fingers.

Of equal importance is the survival value of this means of propagation. While *Q. prinoides* usually produces acorns quite abundantly, failure to find seedlings is the rule rather than the exception. The acorns of this species fall very early in the season, and according to Dr. Ronald L. McGregor (oral communication) soon disappear, apparently being eaten by small animals. Those plants which do become established are usually found in more open places, or at the margins of woodlands. As pointed out by Muller (l.c.), the survival, as well as the invasion of surrounding areas, is effected by the rhizomatous nature of propagation.

Neither should the evolutionary significance of this means of vegetative propagation be overlooked. Although cross pollination in all probability occurs, the hazards of seedling establishment are great, and rarely can they be found. Consequently, the populations can be expected to be genetically pure, with the rate of hybridization and ensuing introgression greatly slowed down,

and the swamping of one species by another kept at a minimum. The population maintains itself vegetatively; therefore, it is morphologically uniform.—William M. Keith, Jr., department of botany, university of kansas, lawrence, kansas.

Note on the Habitat of Aster ptarmicoides.—*Aster ptarmicoides* (Nees) T. & G., grows abundantly in low, wet, clayey and presumably calcareous soil in a restricted area along the edge of a golf links at Manchester, Vermont. I have placed a specimen which I collected at this station on August 27, 1956, in the Herbarium of the New England Botanical Club.

In Gray's Manual 8th Ed. (1950) Fernald's key to the §*Orthomeris* to which this species is assigned uses the word "xerophytic" as a diagnostic trait of *A. ptarmicoides.* He describes its habitat as "dry, mostly calcareous, rocks, bluffs and sands." Gray's Manual 7th Ed. (1907) specified the habitat as "dry, calcareous soil." In Britton & Brown (1952) Gleason uses the phrase "prairies and other usually dry places," without referring to its apparent preference for calcareous soils.

An examination of the material in the Gray and New England Botanical Club Herbaria reveals that out of 106 specimens 39 labels give no significant habitat data; 41 were from distinctly xerophytic or dry situations, chiefly calcareous; 19 from low ground, sandy or rocky shores, etc.; 5 from "moist" or "wet" low ground or meadow; and one each from "limey" and "clayey" soil (excluding my specimen). Judging by the localities from which the 39 unannotated specimens were collected I imagine that many of them were from calcareous regions.

Thus, it appears that *A. ptarmicoides* is not a true xerophyte, is probably a calciphile, and frequently occurs in moist to wet soils. Perhaps future printings of Gray's and Britton & Brown's should reflect the foregoing observations.—Richard J. Eaton, lincoln, massachusetts.

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ERRATA

Page **14**, line **13**; *for* Tatuxent, *read* Patuxent.
Page **37**, line **16**; for *Termstroemia,* read *Ternstroemia.*
Page **40**, line **19**; for *texana,* read *texanum.*
Page **160**, line **20**; *for* Tatum, *read* Tatnall.
Cover, No. **703**, line **10**; for *Inquirendae et Addendae,* read *Inquirenda et Addenda.*
Page **181**, line **26**; for *inquirendae et addendae,* read *inquirenda et addenda.*
Page **192**, line **9**; *for* Arkanass, *read* Arkansas.
Page **248**, line **29**; for *grandiflora,* read *ptericholdes.*
Page **263**, line **14**; *for* Gorton, *read* Gordon.

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